

Newport-Mesa Unified School District
Office of Secondary Curriculum and Instruction
High School Course of Study

Course Title		HNR Astronomy 1AB			Course Code			
Transcript Title:	HNR Astronomy 1AB			Grades Levels:	11-12	Board Adoption Date:		
Content Area:	Science			GPA Scale:	5.0	Date Course Submitted:		4/2016
Credential Req:	Geoscience		Graduation Subject Areas:		Physical Science			
UC/CSU "A-G" Area Approvals:		To be submitted for "D" (Laboratory Science)		School Site that wrote and submitted the course:			Newport Harbor High School	
Recommend Skills):								
Next course(s):	Physics, AP Physics, AP Chemistry, IB Biology, AP Biology, Physiology							

COURSE DESCRIPTION (*catalog summary*):

Honors Astronomy will introduce students to the fundamental areas of study within the scientific field of Astronomy. Topics will include: The sun, stars, stellar life cycles, stellar remnants, nucleosynthesis, the planets, our solar system, life on earth, search for extra-terrestrial life, the Milky Way, galaxies, the Doppler effect, cosmology, the Big Bang, the shape of space-time, and the fate of the universe. Throughout the course, students will also learn the methods, history, and evolution of human knowledge in astronomy, as mankind has attempted to understand our place in the universe.

GOALS (*expected performance outcomes for students*):

Mastery of California State Science Standards (Grades 9-12) and Next Generation Science Standards (NGSS) including experimental design, scientific writing, and statistical analysis of data with application of Common Core Literacy and Math standards.

Successful achievement of a passing score on the International Baccalaureate Standard Level Astronomy Assessment, which includes: Two (2) external assessments, consisting of one *short answer* Exam Paper and one *short answer AND data response* Exam Paper; Two (2) internal assessments, taken from a range of experiments completed during the course.

CALIFORNIA CONTENT STANDARDS (*how the course aligns with California and/or national curriculum standards*):

See California State Science Standards (9-12) and Next Generation Science Standards in each section below.

EVALUATION (*how the effectiveness of the course will be monitored and assessed*):

Formal assessments will include multiple assessment tools including homework worksheets, laboratory reports, quizzes and end-of-unit tests, and individual and group research projects. Students will pursue additional college preparatory science coursework and science related careers.

Newport-Mesa Unified School District
Office of Secondary Curriculum and Instruction
High School Course of Study

Course Title	HNR Astronomy 1AB	Course Code	
--------------	-------------------	-------------	--

Unit 1	Length of Unit: 8 weeks			
	Key Vocabulary	Standards (referenced)	Model Tasks	Tools / Texts
The Stars The Sun Measuring Stars The birth, life and death of stars	Fusion Nucleosynthesis Hydrostatic equilibrium Corona Photosphere Chromosphere Radiative zone Convective zone Sunspots Limb darkening Granulation Prominence Temperature Luminosity Size Mass Distance Astronomical unit Parallax Hertzprung-Russell diagram Nebular hypothesis Protostar Main sequence Brown dwarf Red dwarf White dwarf Red giant Planetary nebula Supernova Electron degeneracy	California Science Content Standards: Earth Sciences 1. Astronomy and planetary exploration reveal the solar system's structure, scale, and change over time. As a basis for understanding this concept: e. <i>Students know</i> the Sun is a typical star and is powered by nuclear reactions, primarily the fusion of hydrogen to form helium. 2. Earth-based and space-based astronomy reveal the structure, scale, and changes in stars, galaxies, and the universe over time. As a basis for understanding this concept: a. <i>Students know</i> the solar system is located in an outer edge of the disc-shaped Milky Way galaxy, which spans 100,000 light years. c. <i>Students know</i> the evidence indicating that all elements with an atomic number greater than that of lithium have been formed by nuclear fusion in stars. d. <i>Students know</i> that stars differ in their life cycles and that visual, radio, and X-ray telescopes may be used to collect data that reveal those differences. e.* <i>Students know</i> accelerators boost subatomic particles to energy levels that simulate conditions in the stars and in the early history of the universe	Using a Bunsen photometer to measure the luminosity of the sun Build a spectrometer Emission spectra for hydrogen, helium, neon, mercury, etc Sunspot viewing Photographing the sun's photosphere Refraction and diffraction to produce a visible spectrum Diffraction to measure wavelength Transfer of energy via conduction/convection/radiation Convection rates vs temperature	<u>Universe</u> Textbook Flinn Lab Kits NHHS Science Department Lab Kits <i>The Universe</i> Video Series <i>How the Universe Works</i> Video Series <i>Crash Course Astronomy</i> Video Series Khan Academy Videos

Newport-Mesa Unified School District
Office of Secondary Curriculum and Instruction
High School Course of Study

Course Title	HNR Astronomy 1AB	Course Code	
--------------	-------------------	-------------	--

	Pulsar Quasar Magnetar Black hole Schwarzschild radius Event horizon	before stars formed. f.* <i>Students know</i> the evidence indicating that the color, brightness, and evolution of a star are determined by a balance between gravitational collapse and nuclear fusion. 4. Energy enters the Earth system primarily as solar radiation and eventually escapes as heat. As a basis for understanding this concept: a. <i>Students know</i> the relative amount of incoming solar energy compared with Earth's internal energy and the energy used by society. California Science Content Standards: Investigation and Experimentation 1. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other four strands, students should develop their own questions and perform investigations. Students will: a. Select and use appropriate tools and technology (such as computer-linked probes, spreadsheets, and graphing calculators) to perform tests, collect data, analyze relationships, and display data. b. Identify and communicate sources of unavoidable experimental error. c. Identify possible reasons for inconsistent results, such as sources of error or uncontrolled conditions. d. Formulate explanations by using		
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Newport-Mesa Unified School District
Office of Secondary Curriculum and Instruction
High School Course of Study

Course Title	<i>HNR Astronomy 1AB</i>	Course Code	
--------------	--------------------------	-------------	--

		logic and evidence. e. Solve scientific problems by using quadratic equations and simple trigonometric, exponential, and logarithmic functions. f. Distinguish between hypothesis and theory as scientific terms. g. Recognize the usefulness and limitations of models and theories as scientific representations of reality. k. Recognize the cumulative nature of scientific evidence. l. Analyze situations and solve problems that require combining and applying concepts from more than one area of science. n. Know that when an observation does not agree with an accepted scientific theory, the observation is sometimes mistaken or fraudulent (e.g., the Piltdown Man fossil or unidentified flying objects) and that the theory is sometimes wrong (e.g., the Ptolemaic model of the movement of the Sun, Moon, and planets). Proposed Next Generation Science Standards (NGSS) for California 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. ESS1.A: The Universe and Its Stars		
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Newport-Mesa Unified School District
Office of Secondary Curriculum and Instruction
High School Course of Study

Course Title	HNR Astronomy 1AB	Course Code	
--------------	-------------------	-------------	--

		▪ The star called the sun is changing and will burn out over a lifespan of approximately 10 billion years. (HS-ESS1-1) ▪ The study of stars' light spectra and brightness is used to identify compositional elements of stars, their movements, and their distances from Earth. (HS-ESS1-2),(HS-ESS1-3) ▪ Other than the hydrogen and helium formed at the time of the Big Bang, nuclear fusion within stars produces all atomic nuclei lighter than and including iron, and the process releases electromagnetic energy. Heavier elements are produced when certain massive stars achieve a supernova stage and explode. (HS-ESS1-2),(HS-ESS1-3) PS3.D: Energy in Chemical Processes and Everyday Life ▪ Nuclear Fusion processes in the center of the sun release the energy that ultimately reaches Earth as radiation. (secondary to HS-ESS1-1)		
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Newport-Mesa Unified School District
Office of Secondary Curriculum and Instruction
High School Course of Study

Course Title	HNR Astronomy 1AB	Course Code	
--------------	-------------------	-------------	--

		PS4.B Electromagnetic Radiation Atoms of each element emit and absorb characteristic frequencies of light. These characteristics allow identification of the presence of an element, even in microscopic quantities. (secondary to HS-ESS1-2)		
Differentiation	Support -- for students who are struggling with the content	Process: Strategies for Struggling Students: see attached (<i>www.minisink.com</i>)		
	Extension – for high achieving students.	Process: GATE Strategies: see attached		
Evaluation	Formative Assessments (<i>ongoing & mid-lesson</i>): Homework assignments- Handouts, Guided Reading/Close Reading, WebAssign Quizzes- Based on lecture content, homework, and lab activities Laboratory Report(s)- Technical writing, including data acquisition/organization/analysis, data tables and graphing using Excel			
	Summative Assessments (<i>unit final evaluation</i>): Comprehensive unit exam- Multiple Choice, Short Answer and Constructed Response Group Research Poster- Student groups will choose a subtopic within the unit on which to pursue further research. Findings will be presented via a mixed media poster display.			

Newport-Mesa Unified School District
Office of Secondary Curriculum and Instruction
High School Course of Study

Course Title	<i>HNR Astronomy 1AB</i>	Course Code	
---------------------	--------------------------	--------------------	--

Unit 2	Length of Unit: 8 weeks			
	Key Vocabulary	Standards (referenced)	Model Tasks	Tools / Texts
<i>The Planets</i> <i>The origin of planets</i> <i>Life on earth</i> <i>The search for extra-terrestrial life</i>	Accretion T-Tauri phase Planetesimals Differentiation Orbit Ecliptic Mercury Venus Earth Moon Mars Asteroid belt Jovian planets Galilean moons Jupiter Europa Io Callisto Ganymede Saturn Titan Enceladus Neptune Uranus Kuiper belt Oort cloud Extra-solar planets Goldilocks zone Drake equation	California Science Content Standards: Earth Sciences Earth's Place in the Universe 1. Astronomy and planetary exploration reveal the solar system's structure, scale, and change over time. As a basis for understanding this concept: a. <i>Students know</i> how the differences and similarities among the sun, the terrestrial planets, and the gas planets may have been established during the formation of the solar system. b. <i>Students know</i> the evidence from Earth and moon rocks indicates that the solar system was formed from a nebular cloud of dust and gas approximately 4.6 billion years ago. c. <i>Students know</i> the evidence from geological studies of Earth and other planets suggest that the early Earth was very different from Earth today. d. <i>Students know</i> the evidence indicating that the planets are much closer to Earth than the stars are. f. <i>Students know</i> the evidence for the dramatic effects that asteroid impacts have had in shaping the surface of planets and their moons and in mass extinctions of life on Earth. g.* <i>Students know</i> the evidence for the existence of planets orbiting other stars.	Mapping magnetic field patterns with a compass needle An eclipse method for measuring the distance to the moon Measuring the difference between sidereal and mean solar time Centripetal forces Looking at the magnetic field lines of a straight wire and a solenoid Phases of the moon	<u>Universe</u> Textbook Flinn Lab Kits NHHS Science Department Lab Kits <i>The Universe</i> Video Series <i>How the Universe Works</i> Video Series <i>Crash Course Astronomy</i> Video Series Khan Academy Videos

Newport-Mesa Unified School District
Office of Secondary Curriculum and Instruction
High School Course of Study

Course Title	HNR Astronomy 1AB	Course Code	
--------------	-------------------	-------------	--

		2. Earth-based and space-based astronomy reveal the structure, scale, and changes in stars, galaxies, and the universe over time. As a basis for understanding this concept: a. <i>Students know</i> the solar system is located in an outer edge of the disc-shaped Milky Way galaxy, which spans 100,000 light years. 4. Energy enters the Earth system primarily as solar radiation and eventually escapes as heat. As a basis for understanding this concept: a. <i>Students know</i> the relative amount of incoming solar energy compared with Earth's internal energy and the energy used by society. b. <i>Students know</i> the fate of incoming solar radiation in terms of reflection, absorption, and photosynthesis. c. <i>Students know</i> the different atmospheric gases that absorb the Earth's thermal radiation and the mechanism and significance of the greenhouse effect. d.* <i>Students know</i> the differing greenhouse conditions on Earth, Mars, and Venus; the origins of those conditions; and the climatic consequences of each. 8. Life has changed Earth's atmosphere, and changes in the atmosphere affect conditions for life. As a basis for understanding this concept: a. <i>Students know</i> the thermal structure and chemical composition of the atmosphere.		
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Newport-Mesa Unified School District
Office of Secondary Curriculum and Instruction
High School Course of Study

Course Title	HNR Astronomy 1AB	Course Code	
--------------	-------------------	-------------	--

		b. <i>Students know</i> how the composition of Earth's atmosphere has evolved over geologic time and know the effect of outgassing, the variations of carbon dioxide concentration, and the origin of atmospheric oxygen. c. <i>Students know</i> the location of the ozone layer in the upper atmosphere, its role in absorbing ultraviolet radiation, and the way in which this layer varies both naturally and in response to human activities. California Science Content Standards: Investigation and Experimentation 1. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other four strands, students should develop their own questions and perform investigations. Students will: a. Select and use appropriate tools and technology (such as computer-linked probes, spreadsheets, and graphing calculators) to perform tests, collect data, analyze relationships, and display data. b. Identify and communicate sources of unavoidable experimental error. c. Identify possible reasons for inconsistent results, such as sources of error or uncontrolled conditions. d. Formulate explanations by using logic and evidence. e. Solve scientific problems by using		
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Newport-Mesa Unified School District
Office of Secondary Curriculum and Instruction
High School Course of Study

Course Title	<i>HNR Astronomy 1AB</i>	Course Code	
--------------	--------------------------	-------------	--

		quadratic equations and simple trigonometric, exponential, and logarithmic functions. f. Distinguish between hypothesis and theory as scientific terms. g. Recognize the usefulness and limitations of models and theories as scientific representations of reality. k. Recognize the cumulative nature of scientific evidence. l. Analyze situations and solve problems that require combining and applying concepts from more than one area of science. n. Know that when an observation does not agree with an accepted scientific theory, the observation is sometimes mistaken or fraudulent (e.g., the Piltdown Man fossil or unidentified flying objects) and that the theory is sometimes wrong (e.g., the Ptolemaic model of the movement of the Sun, Moon, and planets). Proposed Next Generation Science Standards (NGSS) for California HS-ESS1-4. Use mathematical or computational representations to predict the motion of orbiting objects in the solar system. 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. HS-ESS2-7. Construct an argument based on evidence about		
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Newport-Mesa Unified School District
Office of Secondary Curriculum and Instruction
High School Course of Study

Course Title	<i>HNR Astronomy 1AB</i>	Course Code	
--------------	--------------------------	-------------	--

		the simultaneous coevolution of Earth's systems and life on Earth. ESS1.B: Earth and the Solar System • 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. (HS-ESS1-4) ESS1.C: The History of Planet Earth ▪ Continental rocks, which can be older than 4 billion years, are generally much older than the rocks of the ocean floor, which are less than 200 million years old. (HS-ESS1-5) ▪ Although active geologic processes, such as plate tectonics and erosion, have destroyed or altered most of the very early rock record on Earth, other objects in the solar system, such as lunar rocks, asteroids, and meteorites, have changed little over billions of years. Studying these objects can provide information about Earth's formation and early history. (HS-ESS1-6) ESS2.B: Plate Tectonics and Large-Scale System Interactions ▪ Plate tectonics is the unifying theory that explains the past		
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Newport-Mesa Unified School District
Office of Secondary Curriculum and Instruction
High School Course of Study

Course Title	<i>HNR Astronomy 1AB</i>	Course Code	
--------------	--------------------------	-------------	--

		and current movements of the rocks at Earth's surface and provides a framework for understanding its geologic history. (ESS2.B Grade 8 GBE) (secondary to HS-ESS1-5) PS1.C: Nuclear Processes ▪ Spontaneous radioactive decays follow a characteristic exponential decay law. Nuclear lifetimes allow radiometric dating to be used to determine the ages of rocks and other materials. (secondary to HS-ESS1-5),(secondary to HS-ESS1-6) HS-ESS2-3. Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection. ESS1.B: Earth and the Solar System ▪ Cyclical changes in the shape of Earth's orbit around the sun, together with changes in the tilt of the planet's axis of rotation, both occurring over hundreds of thousands of years, have altered the intensity and distribution of sunlight falling on the earth. These phenomena cause a cycle of ice ages and other gradual climate changes. (secondary to HS-ESS2-4) ESS2.B: Plate Tectonics and Large-Scale System Interactions ▪ The radioactive decay of unstable isotopes continually generates		
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Newport-Mesa Unified School District
Office of Secondary Curriculum and Instruction
High School Course of Study

Course Title	HNR Astronomy 1AB		Course Code	
		new energy within Earth’s crust and mantle, providing the primary source of the heat that drives mantle convection. Plate tectonics can be viewed as the surface expression of mantle convection. (HS-ESS2-3) ▪ Plate tectonics is the unifying theory that explains the past and current movements of the rocks at Earth’s surface and provides a framework for understanding its geologic history. Plate movements are responsible for most continental and ocean-floor features and for the distribution of most rocks and minerals within Earth’s crust. (ESS2.B Grade 8 GBE) (HS-ESS2-1)		
Differentiation	Support -- for students who are struggling with the content	Process: Strategies for Struggling Students: see attached (<i>www.minisink.com</i>)		
	Extension – for high achieving students.	Process: GATE Strategies: see attached		
Evaluation	Formative Assessments (ongoing & mid-lesson): Homework assignments- Handouts, Guided Reading/Close Reading, WebAssign Quizzes- Based on lecture content, homework, and lab activities Laboratory Report(s)- Technical writing, including data acquisition/organization/analysis, data tables and graphing using Excel			
	Summative Assessments (unit final evaluation): Comprehensive unit exam- Multiple Choice, Short Answer and Constructed Response Group Research Presentation- Student groups will choose a subtopic within the unit on which to pursue further research. Findings will be presented via group presentation to the class.			

Newport-Mesa Unified School District
Office of Secondary Curriculum and Instruction
High School Course of Study

Course Title	<i>HNR Astronomy 1AB</i>	Course Code	
---------------------	--------------------------	--------------------	--

Newport-Mesa Unified School District
Office of Secondary Curriculum and Instruction
High School Course of Study

Course Title	<i>HNR Astronomy 1AB</i>	Course Code	
---------------------	--------------------------	--------------------	--

Unit 3	Length of Unit: 8 weeks			
	Key Vocabulary	Standards (referenced)	Model Tasks	Tools / Texts
Galaxies The Milky Way Measuring Galaxies Active Galaxies	Parsec Light year Small-angle formula Doppler effect Red shift Hubble's Law Spiral galaxy Barred-spiral galaxy Elliptical galaxy Lenticular galaxy Dwarf galaxy Magellanic clouds Molecular clouds Interstellar medium Accretion disc Supermassive black hole	California Science Content Standards: Earth Sciences 2. Earth-based and space-based astronomy reveal the structure, scale, and changes in stars, galaxies, and the universe over time. As a basis for understanding this concept: a. <i>Students know</i> the solar system is located in an outer edge of the disc-shaped Milky Way galaxy, which spans 100,000 light years. b. <i>Students know</i> galaxies are made of billions of stars and comprise most of the visible mass of the universe. California Science Content Standards: Investigation and Experimentation 1. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other four strands, students should develop their own questions and perform investigations. Students will: a. Select and use appropriate tools and technology (such as computer-linked probes, spreadsheets, and graphing calculators) to perform tests, collect data, analyze relationships, and display data. b. Identify and communicate sources	Assessing limiting visual stellar magnitudes The lens formula Magnification of a lens system Study of a constellation	<u>Universe</u> Textbook Flinn Lab Kits NHHS Science Department Lab Kits <i>The Universe</i> Video Series <i>How the Universe Works</i> Video Series <i>Crash Course Astronomy</i> Video Series Khan Academy Videos

Newport-Mesa Unified School District
Office of Secondary Curriculum and Instruction
High School Course of Study

Course Title	HNR Astronomy 1AB	Course Code	
--------------	-------------------	-------------	--

		of unavoidable experimental error. c. Identify possible reasons for inconsistent results, such as sources of error or uncontrolled conditions. d. Formulate explanations by using logic and evidence. e. Solve scientific problems by using quadratic equations and simple trigonometric, exponential, and logarithmic functions. f. Distinguish between hypothesis and theory as scientific terms. g. Recognize the usefulness and limitations of models and theories as scientific representations of reality. k. Recognize the cumulative nature of scientific evidence. l. Analyze situations and solve problems that require combining and applying concepts from more than one area of science. n. Know that when an observation does not agree with an accepted scientific theory, the observation is sometimes mistaken or fraudulent (e.g., the Piltdown Man fossil or unidentified flying objects) and that the theory is sometimes wrong (e.g., the Ptolemaic model of the movement of the Sun, Moon, and planets). Proposed Next Generation Science Standards (NGSS) for California HS-ESS1-2. Construct an explanation of the Big Bang theory based on astronomical evidence of light spectra, <u>motion of distant galaxies</u>, and composition of matter in		
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Newport-Mesa Unified School District
Office of Secondary Curriculum and Instruction
High School Course of Study

Course Title	<i>HNR Astronomy 1AB</i>	Course Code	
---------------------	--------------------------	--------------------	--

		the universe.		
Differentiation	Support -- for students who are struggling with the content	Process: Strategies for Struggling Students: see attached (<i>www.minisink.com</i>)		
	Extension – for high achieving students.	Process: GATE Strategies: see attached		
Evaluation	Formative Assessments (ongoing & mid-lesson): Homework assignments- Handouts, Guided Reading/Close Reading, WebAssign Quizzes- Based on lecture content, homework, and lab activities Laboratory Report(s)- Technical writing, including data acquisition/organization/analysis, data tables and graphing using Excel			
	Summative Assessments (unit final evaluation): Comprehensive unit exam- Multiple Choice, Short Answer and Constructed Response Group Research Project- Student groups will choose a subtopic within the unit on which to pursue further research. Findings will be presented via a mixed media poster display.			

Newport-Mesa Unified School District
Office of Secondary Curriculum and Instruction
High School Course of Study

Course Title	HNR Astronomy 1AB	Course Code	
--------------	-------------------	-------------	--

Unit 4	Length of Unit: 8 weeks			
	Key Vocabulary	Standards (referenced)	Model Tasks	Tools / Texts
Cosmology The birth, life and death of the universe Large scale structures in the universe The fundamental shape of spacetime	Big Bang Steady-state Redshift Cosmic microwave background radiation Olber's paradox Galaxy filaments, groups and clusters Supercluster Great wall Spacetime Open, closed and flat universe Big crunch Big rip Cosmological constant Dark matter Dark energy	California Science Content Standards: Earth Sciences 2. Earth-based and space-based astronomy reveal the structure, scale, and changes in stars, galaxies, and the universe over time. As a basis for understanding this concept: b. <i>Students know</i> galaxies are made of billions of stars and comprise most of the visible mass of the universe. e.* <i>Students know</i> accelerators boost subatomic particles to energy levels that simulate conditions in the stars and in the early history of the universe before stars formed. g.* <i>Students know</i> how the red-shift from distant galaxies and the cosmic background radiation provide evidence for the “big bang” model that suggests that the universe has been expanding for 14 billion years. California Science Content Standards: Investigation and Experimentation 1. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other four strands, students should develop their own questions and perform investigations. Students will:	The Doppler effect	<u>Universe</u> Textbook Flinn Lab Kits NHHS Science Department Lab Kits <i>The Universe</i> Video Series <i>How the Universe Works</i> Video Series <i>Crash Course Astronomy</i> Video Series Khan Academy Videos

Newport-Mesa Unified School District
Office of Secondary Curriculum and Instruction
High School Course of Study

Course Title	<i>HNR Astronomy 1AB</i>	Course Code	
--------------	--------------------------	-------------	--

		a. Select and use appropriate tools and technology (such as computer-linked probes, spreadsheets, and graphing calculators) to perform tests, collect data, analyze relationships, and display data. b. Identify and communicate sources of unavoidable experimental error. c. Identify possible reasons for inconsistent results, such as sources of error or uncontrolled conditions. d. Formulate explanations by using logic and evidence. e. Solve scientific problems by using quadratic equations and simple trigonometric, exponential, and logarithmic functions. f. Distinguish between hypothesis and theory as scientific terms. g. Recognize the usefulness and limitations of models and theories as scientific representations of reality. k. Recognize the cumulative nature of scientific evidence. l. Analyze situations and solve problems that require combining and applying concepts from more than one area of science. n. Know that when an observation does not agree with an accepted scientific theory, the observation is sometimes mistaken or fraudulent (e.g., the Piltdown Man fossil or unidentified flying objects) and that the theory is sometimes wrong (e.g., the Ptolemaic model of the movement of the Sun, Moon, and planets).		
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Newport-Mesa Unified School District
Office of Secondary Curriculum and Instruction
High School Course of Study

Course Title	HNR Astronomy 1AB	Course Code	
--------------	-------------------	-------------	--

		Proposed Next Generation Science Standards (NGSS) for California 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. ESS1.A: The Universe and Its Stars The Big Bang theory is supported by observations of distant galaxies receding from our own, of the measured composition of stars and non-stellar gases, and of the maps of spectra of the primordial radiation (cosmic microwave background) that still fills the universe. (HS-ESS1-2)		
Differentiation	Support -- for students who are struggling with the content	Process: Strategies for Struggling Students: see attached (www.minisink.com)		
	Extension – for high achieving students.	Process: GATE Strategies: see attached		
Evaluation	Formative Assessments (<i>ongoing & mid-lesson</i>): Homework assignments- Handouts, Guided Reading/Close Reading, WebAssign Quizzes- Based on lecture content, homework, and lab activities Laboratory Report(s)- Technical writing, including data acquisition/organization/analysis, data tables and graphing using Excel			
	Summative Assessments (<i>unit final evaluation</i>): Comprehensive unit exam- Multiple Choice, Short Answer and Constructed Response “Heroes of Astronomy” Research Project- Students will choose an historical or modern figure in Astronomy/Space Science (from Galileo Galilei to Annie Jump Cannon, from Neil Armstrong to Neil DeGrasse Tyson) about whom they will pursue further			

Newport-Mesa Unified School District
Office of Secondary Curriculum and Instruction
High School Course of Study

Course Title	<i>HNR Astronomy 1AB</i>	Course Code	
---------------------	--------------------------	--------------------	--

	research. Findings will be presented during a “meet the heroes of Astronomy” day, where students will come to class in character, as the subject of their research.
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Newport-Mesa Unified School District
Office of Secondary Curriculum and Instruction
High School Course of Study

Course Title	HNR Astronomy 1AB	Course Code	
--------------	-------------------	-------------	--

STRATEGIES FOR STRUGGLING STUDENTS

ACADEMIC

• Instructional Strategies:

- List objectives and goals for lesson and/or day at a glance
- Differentiate instruction into tiers or by learning style / multiple intelligence
- Use of formative, summative, formal, and informal assessments
- Data: Use data from classroom tests and assignments to inform instruction and re-teach where necessary
- Provide rubrics with expectations before assigning a task or project
- Present information in multiple formats (visual, graphic organizer, auditory, etc.)
- Mnemonics and memory aides
- Cooperative learning strategies with clearly defined roles (ex. Think-Pair-Share)
- Flexible grouping for ability based instruction
- Use review games to make learning fun
- Use of flashcards to aid in study and recall
- Cross-content integration
- Repetition and repeated practice
- Instructional model: Introduction → Guided practice → Independent practice
- Instruction in test-taking strategies
- Peer tutoring: same age or cross age
- Allow students to recycle assignments and tests
- Have students write their own study questions or tests.
- Prioritize tasks with stars or by highlighting
- Pre-teach content vocabulary across content areas

• Modifications and Accommodations:

- **Time:** *extended time on classroom assignments, tasks, tests, and quizzes*
- **Directions:** *read directions aloud, restate and clarify directions, highlight key words, have students repeat directions back to teacher or class*
- Grade content area work on content, not mechanics, grammar, and punctuation
- Use of timer to cue student as to timeline / deadline
- Line guide or index card to keep place when reading
- Use of graphic organizers
- Use of manipulatives and hands-on materials
- Modify assignments and homework to be on student's instructional level
- Use of Alpha-Smart or computer to complete tasks
- Provide a copy of class notes or an outline on which student can take notes
- Provide work samples as a model (examples and non-examples)

Newport-Mesa Unified School District
Office of Secondary Curriculum and Instruction
High School Course of Study

Course Title	HNR Astronomy 1AB	Course Code	
--------------	-------------------	-------------	--

- Limit number of items on a page
- Use of word bank

• **Communication:**

- Frequent communication between home and school
- AIS (Academic Intervention Services)
- AIS Services on a consult basis
- AIS services on a regular basis
- Consistency and communication between AIS and classroom instruction

• **Reading**

- Use of intervention components in reading series
- Use of online resources in reading series
- Vocabulary development
- Pre-read in small groups
- Books on tape / auditory recordings of stories
- High interest/low level reading materials

• **Math**

- Vocabulary development
- Pre-teach concepts in small groups
- Use of online resources of math series
- Use of manipulatives

• **Speech / Language**

- Model correct speech
- Encourage eye contact with speaker
- Extra time to process
- Prompts to expand use of language
- Prompts to slow down for sake of articulation
- Prompts to remain on topic
- Verbal cues to encourage verbal communication
- Teach signal words and key words

BEHAVIORAL AND SOCIAL

• **Classroom-based strategies:**

- Structure and consistency in classroom environment
- Establish classroom rules and expectations
- Provide options and choices (i.e. where to complete work in the room)

Newport-Mesa Unified School District
Office of Secondary Curriculum and Instruction
High School Course of Study

Course Title	HNR Astronomy 1AB	Course Code	
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- Use of timer
- Preferential seating; sit next to peer-model
- Incorporate opportunities for movement within the classroom
- Integration of character education into curriculum
- Logical consequences
- Opportunities for breaks and “time-outs”

• **Cueing, Prompting, and Praising systems:**

- Catch them doing right!
- Positive attention and specific praise
- Make a “connection” with student through 1:1 attention or interest in his/her interests
- Visual prompts and signals
- Physical prompts and signals, including the use of teacher proximity
- Advance warning of transitions and changes in schedule

• **Reinforcements:**

- Reward system: *daily, weekly behavior charts*
- Self-monitoring behavior charts
- Behavior contracts
- Behavior plan or chart
- Give student a “job” or classroom responsibility
- Involve student in a greater cause -- community service (K-Kids)
- Communication between home and school (email, phone, communication journal, planner, etc.)
- Support from the office or administration

• **Social Skills:**

- Social role-play activities in class
- Non-mandated social skills group

ORGANIZATION

- Structure and consistency in classroom environment
- To-do list - break down into small increments if necessary
- List objectives for lesson
- Provide schedule of daily activities or post in a visible location
- Study-buddy / Pack-up buddy
- Back-pack check before dismissal
- Copy of class notes or outline on which to take notes
- After note taking, allow students time to compare their notes

Newport-Mesa Unified School District
Office of Secondary Curriculum and Instruction
High School Course of Study

Course Title	HNR Astronomy 1AB	Course Code	
--------------	-------------------	-------------	--

- Separate / Color coded folders
- Extended time on classroom tests, quizzes, and assignments
- Repetition and consistency
- Homework chart tied to incentives
- Advance warning of transitions / changes in schedule
- Provide examples and non-examples

• **Desk:**

- Neat desk awards
- Photos / examples of neat desk
- Store textbooks in an alternate location

• **Communication:**

- Frequent communication between home and school via planner, email, phone, communication journal
- Use of teacher web page with relevant resources
- Use of online components of reading / math series to be able to access the textbook from home
- Keep extra planner pages in the classroom in case student forgets planner at home.
- Parent/Teacher conference

ATTENTION

- **Directions:** *read directions aloud, restate and clarify directions, highlight key words, have students repeat directions back to teacher or class*
- To-do list - break down into small increments of time if necessary
- Incorporate opportunities for movement within the classroom
- Breaks between papers / assignments
- Provide alternate workspace (two desks)
- Redirect to task
- Use of timer
- Provide options and choices (i.e. where to complete work in the room)
- Preferential seating
- Study-buddy
- Cooperative learning with clearly defined roles in-group work
- Use of manipulatives and hands-on materials
- Use of a “fidget” item like a squeeze ball, Velcro strip, or carpet under chair
- Target area of strength to boost area of weakness/concern
- Parent/teacher conference

MISCELLANEOUS

Newport-Mesa Unified School District
Office of Secondary Curriculum and Instruction
High School Course of Study

Course Title	<i>HNR Astronomy 1AB</i>	Course Code	
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- Teacher to teacher assistance (ex. use of mentor, peer observation, etc.)
- Make small, manageable, and achievable goals. Do not set up for failure!
- Set reasonable goals and expectations
- Recommend / model good health and nutrition habits
- Enrichment centers and assignments for students who finish early.

Source: www.minisink.com

GIFTED STUDENTS: RECOMMENDATIONS FOR TEACHERS

It is estimated that students who are gifted and highly talented encompass 5 to 15% of the school age population. These advanced students can have increased capabilities in academics, creativity, music, dance, art, and/or leadership. The following strategies are recommended:

1. **Compact the curriculum and provide enrichment activities.** Provide environments that are stimulating, and address cognitive, physical, emotional, and social needs of gifted children in the curriculum. Let the students move quickly through the required curriculum content and onto more advanced material. Allow for academic rigor.
2. **Implement a multi-level and multi-dimensional curriculum.** Differentiate the curriculum in order to address differences in the rate, depth, and pace of learning. This will enable all students in the class to learn about a specific area by creating projects at their own ability level. For example, if students are learning about the modern atomic theory, students of different ability levels can be assigned to different types of tasks. At the conclusion of the class, all of the students can present what they have learned to the entire group.
3. **Be flexible with the curriculum.** Take advantage of real-life experiences that can be translated into problem-solving academics for all students. For example, an impending snowstorm can be used to instruct students. Students of different ability levels are given different tasks, such as figuring out the hydrogen bonding in ice and snow and determining the biological importance of ice being less dense than water.
4. **Make the curriculum student-centered.** Engage gifted students in the curriculum decision-making process, giving them an opportunity to learn how to take responsibility for their own learning. Draw the curriculum from the students' interests and educational needs.
5. **Allow students to pursue independent projects based on their own individual interests.** Independent projects can be assigned on the basis of ability level. Encourage creativity and original thinking among gifted students. Allow them to explore ways of connecting unrelated issues in creative ways.
6. **Allow gifted children to assume ownership of their own learning through curriculum acceleration.** Instruct them to work ahead to problems of skills that they do not know. To help children learn the value of attaining knowledge in their lives, encourage learning for its own sake, rather than emphasizing the end results or accomplishments. Teach research skills for accessing information; higher level thinking skills for processing it; creative thinking and problem-solving skills for flexibility in approach and generation of information; and communication skills for sharing it.
7. **Try to maximize your students' potential by expecting them to do their best.** Encourage them to advance as quickly as they can. Assist in developing projects that allow them to achieve success one step at a time.

Newport-Mesa Unified School District
Office of Secondary Curriculum and Instruction
High School Course of Study

Course Title	<i>HNR Astronomy 1AB</i>	Course Code	
--------------	--------------------------	-------------	--

8. **Teach interactively.** Have students work together, teach one another, and actively participate in their own and their classmates' education. Note: This does not advocate gifted children being peer tutors in the classroom; the gifted student should be challenged as well. Emphasis should be on working together in the classroom. Cluster gifted children together as a table within the regular classroom and utilize advanced materials, as well as other suggested resources and modification, to meet their exceptional needs.
9. **Explore many points of view about contemporary topics and allow opportunity to analyze and evaluate material.** Allow open forums and debates in the classroom about controversial issues. As a teacher of gifted children, take an active stance. Be an advocate for gifted students. Utilize specialized training to ensure the ability to meet the needs of gifted students. Share personal interests with all students, to enrich and expand their world.
10. **Consider team teaching, collaboration, and consultation with other teachers.** Use the knowledge, skills, and support of other educators or professionals in the schools.
11. **Provide opportunities for gifted children to interact with other gifted children across grade levels and schools through competitions or collaborative projects.**
12. **Encourage gifted students to participate in extracurricular activities that involve academic skills.** Examples include math and debate teams. Because gifted children are often natural leaders, it is important to invite them to use their talents and abilities in beneficial, rather than disruptive, manners. For example, encourage the gifted student to run for office in student council, or another extracurricular activity in which he/she is involved.
13. **Involve students in academic contests.** Gifted students tend to be competitive by nature. Therefore, participating in regional and national competitions such as spelling bees, science fairs, and essay competitions will be fun challenges.
14. **Allow gifted children to create and publish a class newspaper to distribute.** This consists of assisting students in understanding their special capabilities and the training necessary for them to reach their full potential.
15. **Set individual goals.** Help guide students in creating their own goals and set goals that are specific, measurable, aggressive, realistic, and within a reasonable time frame. Be sure not to place expectations that are too high or too low.
16. **Consider parental input about the education of their gifted children.**
17. **Always remember that gifted children are similar in many ways to the average child in the classroom.** Do not place unrealistic expectations and pressures on gifted children.
18. **Address the counseling needs of each student to support emotional growth, as needed.** Some gifted students have issues regarding anger, boredom, bullying, delinquency, isolation, depression, peer relations, perfectionism, dropping out of school, stress, frustration, and underachievement. About 20-25% of gifted students have emotional difficulties.
19. **Remember that gifted children may not excel in all areas.** They may be ahead of other students in some areas and behind in some areas. Become aware of the strengths and weaknesses of the children in your class.
20. **Do not assign extra work to gifted children who finish assignments early.** This is unfair and frustrating to them. Simply offering more of the same only restricts further learning. Instead, allow those children to work on independent projects or other unfinished work when they finish an assignment early.
21. **If a child attends resource rooms, communicate with the specialist for suggestions on how to enrich daily classwork.** Avoid penalizing the child for special class attendance. Have another child in the regular classroom take notes and assignments for him/her.
22. **Provide plenty of opportunities for gifted children and average children to engage in social activities.** Some gifted children may need help in developing social skills.

Newport-Mesa Unified School District
Office of Secondary Curriculum and Instruction
High School Course of Study

Course Title	<i>HNR Astronomy 1AB</i>	Course Code	
--------------	--------------------------	-------------	--

- 23. Try to find the joy and uniqueness in each child.** Children may exhibit their gifts on non-typical levels, rather than in general intellectual aptitude of specific academic abilities. Keep in mind that every child will have different needs.
- 24. Organize resources in order to free yourself to work with individual children and give the children greater control of the learning situation.** Supplementary books and learning tools, community resources, and the use of community members with specific skills as mentors can be helpful.
- 25. Establish and maintain a warm, accepting classroom.** Teach your classroom community to embrace diversity and honor differences. Provide an environment in which the child can demonstrate his or her potential or aptitude to learn and perform. Teachers should strive to establish a noncompetitive, individualized, and open classroom, which allows all students to advance at their own rate of learning.
- 26. Remember that implementing some of these strategies will benefit all of the children in the classroom, not just the gifted ones.**

Newport-Mesa Unified School District
Office of Secondary Curriculum and Instruction
High School Course of Study

Course Title	<i>HNR Astronomy 1AB</i>	Course Code	
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www.canteach.ca/links/linkgifted.html: Challenging Gifted Students in Regular Classrooms.

www.nagc.org: National Association for Gifted Students: Supporting the needs of high potential learners.

www.nwrel.org/msec/just_good/9/ch4.html: Strategies for Teaching Gifted Students in the Inclusion Classroom.

www.teachersfirst.com/gifted.shtml: Working with Gifted and Talented Students.

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