Title	**Roxbury High School Geo-Physical Science Honors**
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Curriculum Writing History	
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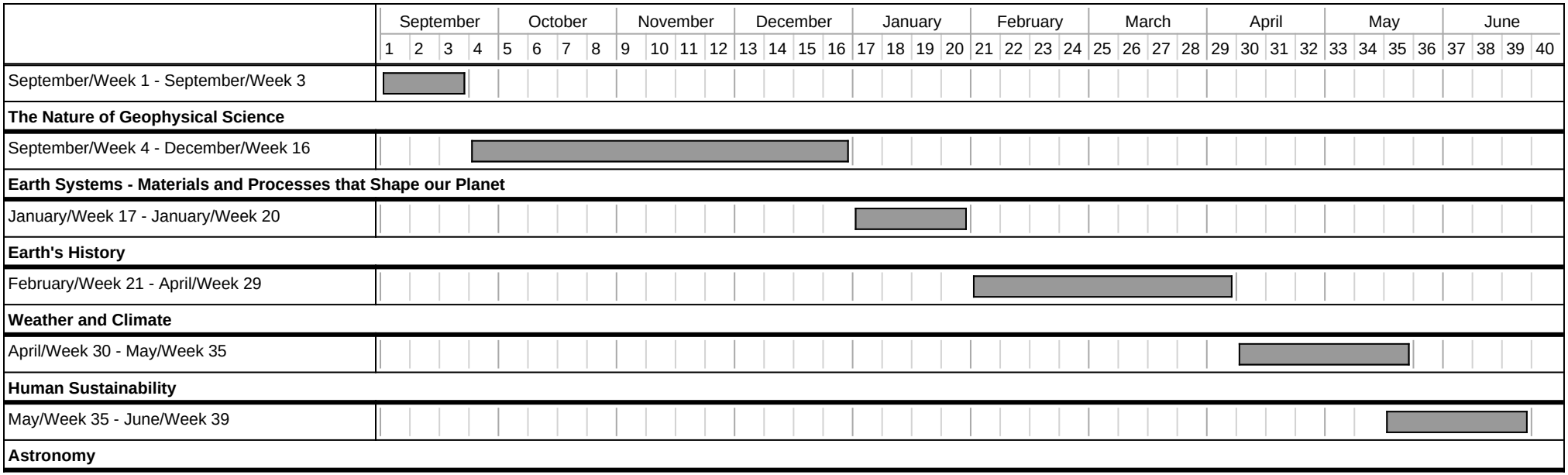
Attachments	

Title : Roxbury High School Geo-Physical Science Honors
Type : Consensus



Title : Roxbury High School Geo-Physical Science Honors
Type : Consensus

Duration: September/Week 1 - September/Week 3					
UNIT NAME: The Nature of Geophysical Science					
Enduring Understandings	**Essential Questions**	**Knowledge**	**Skills**	**Assessment**	**Standards**
Measurement and observation tools are used to categorize, represent and interpret the natural world. Evidence is used for building, refining, and/or critiquing scientific explanations. Scientific knowledge builds itself over time. The growth of scientific knowledge involves critique and communication - social practices that are governed by a core set of values and norms Topographic maps represents a portion of earth's surfaces of the ocean floor and land surface. On a topographic map, contour lines are used to represent the difference in elevation. The closer the contour lines the steeper the elevation. Topographic maps use a legend that	Why is lab safety important? Critique several lab scenarios for correct and incorrect lab procedures. What might cause changes in accepted scientific ideas and theories? What is science? What is Earth Science? How do science and society interact and how each affects the other? Why is the metric system used? How do I measure and convert units in metric? What is the importance of the collaboration of knowledge between scientists when testing scientific ideas? What is topography? What are the main types	Demonstrate proper laboratory safety procedures. Record all lab data using the SI unit system. Construct a graph using the results of lab data. Collaborate with peers the results of lab findings. How to interpret scientific data and derive conclusions. Landforms can be illustrated by a 2-dimensional map Many different kinds of people are involved in Earth science and its related fields. Scientists use observation, experimentation, and theoretical and mathematical models to explain nature. Over the years many scientists have contributed to today's scientific knowledge.	Interpret scientific data and derive conclusions. • Topographic map lab - Interpret the geographic landforms of an area based on a topographic map. Identify the branches and inter-dependent relationships between the branches of Geophysical Science. • Create a branches of Earth Science Graphic Organizer Convert metric measurements • Metric Mania Lab Interpreting graphs. Construct a graph using the results of lab data. • Density Lab - Record all lab data using the SI unit system. Identify how to test a claim using the scientific method lab • Pseudo-science lab		Asking Questions and Defining Problems (09-12)[Regional:Next Generation Science Standards (NGSS)] HS.ETS1.1.SEP.1-Analyze complex real-world problems by specifying criteria and constraints for successful solutions. (HS-ETS1-1) (09-12)[Regional:Next Generation Science Standards (NGSS)] Influence of Science, Engineering, and Technology on Society and the Natural World (09-12)[Regional:Next Generation Science Standards (NGSS)] HS.ESS1.6.SEP.1-Apply scientific reasoning to link evidence to the claims to assess the extent to which the reasoning and data support the explanation or conclusion. (HS-ESS1-6) (09-12)[Regional:Next Generation Science Standards (NGSS)] HS.ESS1.6.CNS.1-A scientific theory is a substantiated explanation of some aspect of the natural world, based on a body of facts that have

indicate certain features.	of landforms? Who would use a topographic map? What does a topographic map show?	New information can lead to new scientific theories and alterations of existing theories.	• Design a lab to test an observation or everyday experience.		been repeatedly confirmed through observation and experiment and the science community validates each theory before it is accepted. If new evidence is discovered that the theory does not accommodate, the theory is generally modified in light of this new evidence. (HS-ESS1-6) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS1.6.CNS.2- Models, mechanisms, and explanations collectively serve as tools in the development of a scientific theory. (HS-ESS1-6) (09-12)[Regional:Next Generation Science Standards (NGSS)] HS.ESS2.3.CNS.1- Science knowledge is based on empirical evidence. (HSESS2-3) (09-12)[Regional:Next Generation Science Standards (NGSS)] HS.ESS2.3.CNS.2- Science disciplines share common rules of evidence used to evaluate explanations about natural systems. (HS-ESS2-3) (09-12)[Regional:Next Generation Science Standards (NGSS)] HS.ESS2.4.CNS.1-

					Science arguments are strengthened by multiple lines of evidence supporting a single explanation. (HS-ESS2-4), (HSESS3-5) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS3.5.CNS.1- Science investigations use diverse methods and do not always use the same set of procedures to obtain data. (HS-ESS3-5) (09-12) [Regional:Next Generation Science Standards (NGSS)]
Plans:					

Title : Roxbury High School Geo-Physical Science Honors
Type : Consensus

Duration: September/Week 4 - December/Week 16					
UNIT NAME: Earth Systems - Materials and Processes that Shape our Planet					
Enduring Understandings	**Essential Questions**	**Knowledge**	**Skills**	**Assessment**	**Standards**
Earth's components form systems. These systems continually interact at different rates of time, affecting the Earth locally and globally. 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. The abundance of liquid water on Earth's surface and its unique combination of physical and chemical properties are central to the planet's dynamics. These properties include water's exceptional capacity to expand upon freezing, dissolve and transport materials, and lower the viscosities and melting points of rocks. Evidence from deep probes and seismic waves, reconstructions of historical changes in Earth's surface and its magnetic field, and an understanding of physical	How and why is Earth constantly changing? How does radioactive decay of unstable isotopes generate new energy within the Earth's crust and mantle drive mantle convection? How can continental rocks, which can be older than 4 billion years, be so much older than rocks of the ocean floor, which are less than 200 million years old? What is thermal convection and how does it act as the mechanism in which tectonic plates are moved across the surface of our planet? What is the theory of plate tectonics and how does it explain the past and current movements of the rocks at Earth's surface? How are plate movements responsible for most	Identify Earth's systems and how they could potentially interact. Identify and describe the components of the physical Earth as a system (inner core, outer core, mantle, crust). Explain and give examples of the dynamic balance between matter and energy within and on the physical Earth. Give examples of how changes in the physical Earth affect other Earth systems and human activity. Describe the physical characteristics of igneous, metamorphic, and sedimentary rocks, including crystal size and shape, mineral and chemical composition, density, and origin. Describe the constructive and destructive processes that drive the rock cycle, including sedimentation, lithification, crystallization, deformation, deposition,	Identify Earth's systems and how they could potentially interact. • River discharge and floods lab Identify and describe the components of the physical Earth as a system (inner core, outer core, mantle, crust). • Layers of the earth foldable Explain and give examples of the dynamic balance between matter and energy within and on the physical Earth. Give examples of how changes in the physical Earth affect other Earth systems and human activity. • Weathering and mass wasting identification portfolio Use selected properties to identify common rock forming mineral groups, including carbonates, halides, oxides, silicates,		HS.ESS2.1-Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features. (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS2.2-Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems. (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS2.3-Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection. (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS2.5-Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes. (09-12) [Regional:Next Generation

and chemical processes lead to a model of a layered Earth. Motions of the mantle and its plates occur primarily through thermal convection, which involves the cycling of matter due to the outward flow of energy from Earth's interior and gravitational movement of denser materials toward the interior.	continental and ocean-floor features and for the distribution of most rocks and minerals within Earth's crust?	erosion, melting, cooling, metamorphism, subsidence, and weathering. Explain the role of gravity and natural agents (water, wind, glaciers) on Earth (landform changes) and how they impact the rock cycle. Explain the principles of hydrology, including evaporation, transpiration, surface and groundwater flows. Describe current efforts and technologies used to study Earth's land features, including remote sensing, GPS, and topographic mapping using satellite and ground-based data. Summarize the evidence and thinking that resulted in the development of the Theory of Plate Tectonics. Explain plate tectonics in terms of magnetic reversals and outer core circulation, mantle convection, sea floor spreading, and subduction. Describe how the Theory of Plate Tectonics explains the location of	sulfates, and sulfides. Describe the physical characteristics of igneous, metamorphic, and sedimentary rocks, including crystal size and shape, mineral and chemical composition, density and origin. • Mineral Identification labs • Rock identification labs Describe how convection, density, and the law of conservation explain the movement of materials within the rock cycle. Describe the constructive and destructive processes that drive the rock cycle, including sedimentation, lithification, crystallization, deformation, deposition, erosion, melting, cooling, metamorphism, subsidence, and weathering. Explain the role of gravity and natural agents (water,wind, glaciers) on Earth (landform changes) and how they impact the rock cycle). • Differential weathering lab Explain the principles of		Science Standards (NGSS)] HS.ESS2.1.SEP.1-Develop a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-ESS2-1) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS2.1.DCI.ESS2.A.1-Earth's systems, being dynamic and interacting, cause feedback effects that can increase or decrease the original changes. A deep knowledge of how feedbacks work within and among Earth's systems is still lacking, thus limiting scientists' ability to predict some changes and their impacts. (HS-ESS2-1) (Note: This disciplinary C ore Idea is also addressed by HS-ESS2-2.) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS2.1.DCI.ESS2.B.2-Plate tectonics is the unifying theory that explains the past and current movements of the rocks at Earth's surface and prov ides a framework for understanding its geologic history . (ESS2.B Grade 8 GBE) (secondary

		earthquakes, volcanoes, hot spots, mountains, mid-ocean ridges, deep-sea trenches, and island arcs. Give examples of how progressive changes on Earth's surface, including Pangaea, are used to document the evolution of Earth through time.	hydrology, including evaporation, transpiration, surface and groundwater flows. • Floods and Rivers lab Describe current efforts and technologies used to study Earth's land features, including spectroscopy, remote sensing, GIS, GPS, imaging, and topographic mapping using satellite and ground-based data. • Mystery box - sonar sounding activity Summarize the evidence and thinking that resulted in the development of the Theory of Plate Tectonics. Explain plate tectonics in terms of magnetic reversals and outer core circulation, mantle convection, sea-floor spreading, and subduction. Describe how the Theory of Plate Tectonics explains the location of earthquakes, volcanoes, hot spots, mountains, mid-ocean ridges, deep-sea trenches, and island arcs. • Plate tectonics Jigsaw activity		to HS-ESS1-5),(HS-ESS2-1) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS2.1.DCI.ESS2.B.2-Plate tectonics is the unifying theory that explains the past and current movements of the rocks at Earth's surface and prov ides a framework for understanding its geologic history . (ESS2.B Grade 8 GBE) (secondary to HS-ESS1-5),(HS-ESS2-1) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS2.2-Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems. (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS2.2.DCI.ESS2.A.1-Earth's systems, being dynamic and interacting, cause feedback effects that can increase or decrease the original changes (HSESS2-2) (09-12)[Regional:Next Generation Science Standards (NGSS)] HS.ESS2.5.SEP.1-Plan and conduct an

			Give examples of how progressive changes on Earth's surface, including Pangaea, are used to document the evolution of Earth through time. • Pangaea puzzle and the story of Alfred Wegener Describe the purpose of current tools and techniques used to study plate tectonics including seismograph data, triangulation (epicenter location and travel-time graphs), satellite sensors, image analysis, sonar and distance measurement, and magnetometers. • Epicenter lab • Earthquake buildings project		investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly . (HS-ESS2-5) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS2.3.SEP.1-Develop a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-ESS2-3),(HS-ESS2-6) (09-12) [Regional:Next Generation Science Standards (NGSS)]
Plans:					

Title : Roxbury High School Geo-Physical Science Honors
Type : Consensus

Duration: January/Week 17 - January/Week 20					
UNIT NAME: Earth's History					
Enduring Understandings	**Essential Questions**	**Knowledge**	**Skills**	**Assessment**	**Standards**
Use concepts of system analysis to identify major historical geology topics and discuss their relationship to other fields of Earth and Space Science. Understanding past processes and contributions is essential in building scientific knowledge. Organisms and their environments are interconnected. Changes in one part of the system will affect other parts of the system.	How and why is Earth constantly changing? How is how the scientific theory of evolution is supported by the fossil record? What objects can provide information about Earth's formation and early history? How do geologic events occurring today provide insight into Earth's past?	Weathering, erosion, and deposition act together in a cycle that wears down and builds up Earth's surface. During radioactive decay, the atoms of one element break down to form atoms of another element. The fossil record provides evidence that many different organisms have existed at different times and that groups of organisms have changed over time. Fossils help scientists infer how Earth's surface has changed. Rock layers provide a record of Earth's geologic history. Weathering, erosion, and deposition act together in a cycle that wears down and builds up Earth's surface. During radioactive decay, the atoms of one element break down to form atoms of another element.	Give examples of how changes in one part of historical geology affected other parts of Earth's systems. Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth • Observe videos from the Paleozoic that show earth systems evolution and evolution of organisms in response to a change in their environment. Describe the dramatic changes in the composition of Earth's atmosphere (introduction of O2) once the presence of single-celled life forms became established. • Graph the percentage of oxygen over geologic time Identify and describe the components of historical geology.		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. (09-12) [Regional:Next Generation Science Standards (NGSS)] ESS1.C-The History of Planet Earth (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS1.5.DCI.ESS1.C.1-Continental rocks, which can be older than 4 billion y ears, are generally much older than the rocks of the ocean floor, which are less than 200 million y ears old. (HS-ESS1-5) (09-12) [Regional:Next Generation Science Standards (NGSS)] ESS2.B-Plate Tectonics and Large-Scale System Interactions (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS1.5.DCI.ESS2.B.2-Plate tectonics is the unifying theory that

		The fossil record provides evidence that many different organisms have existed at different times and that groups of organisms have changed over time. Fossils help scientists infer how Earth's surface has changed. Rock layers provide a record of Earth's geologic history.	• Create a geologic time scale (using eras, periods, and epochs) that shows the major geologic and biologic events, including human's place in the time continuum. Explain and give examples of the dynamic balance between matter and energy throughout the geologic history of Earth. • Geologic Time scale lab • Fossil lab Describe the principles used to determine relative age. Compare similarities and differences between relative age and absolute age. • Relative dating practice problems Describe the principles used to determine absolute age, including radioactive dating, index fossils, fossil correlation. • Half-life of Pennies Lab • Fossil Radioactive Dating Lab Apply scientific reasoning		explains the past and current movements of the rocks at Earth's surface and prov ides a framework for understanding its geologic history . (ESS2.B Grade 8 GBE) (secondary to HS-ESS1-5),(HS-ESS2-1) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS1.5.DCI.PS1.C.1-Spontaneous radioactive decay s 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) (09-12) [Regional:Next Generation Science Standards (NGSS)] 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. (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS1.6.CNS.1-A scientific theory is a substantiated explanation

			and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history. Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species. • Natural selection lab		of some aspect of the natural world, based on a body of facts that have been repeatedly confirmed through observation and experiment and the science community validates each theory before it is accepted. If new evidence is discovered that the theory does not accommodate, the theory is generally modified in light of this new evidence. (HS-ESS1-6) (09-12) [Regional:Next Generation Science Standards (NGSS)] ESS1.C-The History of Planet Earth (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS1.6.DCI.ESS1.C.1-Although active geologic processes, such as plate tectonics and erosion, have destroy ed 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 y ears. Studying these objects can provide information about Earth's formation and early history . (HS-ESS1-6) (09-12) [Regional:Next Generation

					Science Standards (NGSS)] HS.ESS2.1-Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features. (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS2.1.DCI.ESS2.A.1-Earth's systems, being dynamic and interacting, cause feedback effects that can increase or decrease the original changes. A deep knowledge of how feedbacks work within and among Earth's systems is still lacking, thus limiting scientists' ability to predict some changes and their impacts. (HS-ESS2-1) (Note: This disciplinary C ore Idea is also addressed by HS-ESS2-2.) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS2.2-Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems. (09-12) [Regional:Next Generation Science Standards

					(NGSS)] HS.ESS2.3.DCI.ESS2.A.1-Evidence from deep probes and seismic waves, reconstructions of historical changes in Earth's surface and its magnetic field, and an understanding of physical and chemical processes lead to a model of Earth with a hot but solid inner core, a liquid outer core, a solid mantle and crust. Motions of the mantle and its plates occur primarily through thermal convection, which involves the cycling of matter due to the outward flow of energy from Earth's interior and gravitational movement of denser materials toward the interior. (HS-ESS2-3) (09-12)[Regional:Next Generation Science Standards (NGSS)] HS.ESS2.7.DCI.ESS2.E.2-The many dynamic and delicate feedbacks between the biosphere and other Earth systems cause a continual co-evolution of E arth's surface and the life that exists on it. (HSESS2-7) (09-12)[Regional:Next Generation Science Standards (NGSS)] HS.ESS2.7.DCI.ESS2.D.1-Gradual atmospheric

					changes were due to plants and other organisms that captured carbon dioxide and released oxygen. (HS-ESS2-6),(HS-ESS2-7) (09-12)[Regional:Next Generation Science Standards (NGSS)]
Plans:					

Title : Roxbury High School Geo-Physical Science Honors
Type : Consensus

Duration: February/Week 21 - April/Week 29					
UNIT NAME: Weather and Climate					
Enduring Understandings	**Essential Questions**	**Knowledge**	**Skills**	**Assessment**	**Standards**
Earth's components form systems. These systems continually interact at different rates of time affecting the Earth regionally and globally. The structure and composition of Earth's atmosphere is vital to life as we know it. Solar radiation is responsible for global wind patterns that are responsible for creating major climate zones on Earth. Explain how solar radiation is responsible global wind patterns and major climate zones on Earth. The Earth's characteristics and position have made it an ideal habitat for life as we know it. Climates have sometimes changed abruptly in the past as a result of volcanic eruptions or impacts of huge rocks from space. Water evaporates from	How do changes in one part of an Earth system affect other parts of the system? What is climate? How does it differ from weather? What are current climate conditions dependent on? How and why is Earth constantly changing? How have changes in the sun's energy output or Earth's orbit, tectonic events, ocean circulation, volcanic activity, glaciers, vegetation, and human activities affected global and regional climate? What are the varying time-scales that global and regional climate change can occur on?	Energy travels to Earth from the sun as electromagnetic waves. Different materials absorb radiation at different rates. The movement of air between the equator and the poles produces global winds. Nearly all the energy in Earth's atmosphere comes from the sun. Water moves between the atmosphere and Earth's surface in the water cycle. As the sun heats Earth's surface, the amount of water in the atmosphere changes. Human activities are affecting Earth's climate and atmosphere.	Identify and describe the components of the atmosphere • Layers of the Atmosphere Mania Game • Layers of the Atmosphere Graph and Paste • Percent Oxygen in the air lab Analyze measurable elements of weather (atmospheric pressure, dew point, relative humidity, forms of precipitation, wind speed and direction, etc.) essential to predicting large-scale and local weather events. • Pyschrometer (relative humidity) labs Identify the different types of fronts and air masses • Weather Cyclers as a review of basic concepts Apply the weather concepts learned to predict weather when given a scenario and then		HS.ESS2.4.DCI.ESS2.A.2-The geological record shows that changes to global and regional climate can be caused by interactions among changes in the sun's energy output or Earth's orbit, tectonic events, ocean circulation, volcanic activity, glaciers, vegetation, and human activities. These changes can occur on a variety of time scales from sudden (e.g., volcanic ash clouds) to intermediate (ice ages) to very long-term tectonic cycles. (HS-ESS2-4) (09-12)[Regional:Next Generation Science Standards (NGSS)] ESS2.D-Weather and Climate (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS2.4.DCI.ESS2.D.3-The foundation for Earth's global climate systems is the electromagnetic radiation from the sun, as well as its reflection, absorption, storage, and redistribution among the atmosphere, ocean, and land systems, and this

the surface of the earth, rises and cools, condenses into rain or snow, and falls again to the surface. The water falling on land collects in rivers and lakes, soil, and porous layers of rock, and much of it flows back into the oceans. The cycling of water in and out of the atmosphere is a significant aspect of the weather patterns on Earth. Human beings are an integral part of Earth's climate system. Human activities such as fossil fuel burning or deforestation can affect climate and alter the equilibrium of the climate system.	What phenomena cause the reoccurring cycle of ice ages and gradual climate change? What importance does the abundance of liquid water play in the Earth's systems? What role does electromagnetic radiation from the sun, as well as its reflection, absorption, storage, and redistribution among the atmosphere, ocean, and land systems, and this energy's re-radiation into space play in the global climate? How do plants and other organisms that captured carbon dioxide and release oxygen cause atmospheric changes? How has human activity changed the atmosphere?		analyze the limitations of the given predictions? • Isotherm and Isobar interpretation • Station models and Complete Weather Map - Identifying fronts Lab Describe the causes of local and global air and wind patterns, including pressure gradients, density, land and sea breezes, Coriolis effect, and energy exchange. • Pressure demos in front of class. Pressure pullers, vacuum/garbage bag, density spheres, rheoscopic fluid Analyze and compare the heat transfer systems (radiation, convection, conduction) affecting atmospheric circulation pattern which causes differences vertical air motions and their effects on cyclones and anticyclones. • Global and local winds lab • Convection lab Summarize the processes of conduction, convection,		energy 's re-radiation into space. (HS-ESS2-4), (secondary to HS-ESS2-2) (09-12)[Regional:Next Generation Science Standards (NGSS)] HS.ESS2.4.DCI.ESS2.D.4-Changes in the atmosphere due to human activity have increased carbon dioxide concentrations and thus affect climate. (HS-ESS2-4) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS3.5-Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems. (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS2.6-Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere. (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS3.3.CET.1-Modern civilization

			and radiation • Classroom chirades Explain how the transfer of energy in the atmosphere affects the water cycle. Analyze how a severe weather system forms by breaking it into the various components. • Hurricane tracking and video interpretation Construct scientific arguments using data to support claims that spatial and temporal patterns in weather and climate found around the Earth are created by complex global, regional, and local interactions involving sunlight, and all of the Earth's spheres. • Solar Radiation Lab- measure temperature changes in different mediums over a set period of time •		depends on major technological systems. (HS-ESS3-1),(HSESS3-3) (09-12)[Regional:Next Generation Science Standards (NGSS)] HS.ESS3.3.CCC.1-Change and rates of change can be quantified and modeled over very short or very long periods of time. Some system changes are irreversible. (HS-ESS3-3) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS3.2-Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.* (09-12) [Regional:Next Generation Science Standards (NGSS)]
Plans:					

Title : Roxbury High School Geo-Physical Science Honors
Type : Consensus

Duration: April/Week 30 - May/Week 35					
UNIT NAME: Human Sustainability					
Enduring Understandings	**Essential Questions**	**Knowledge**	**Skills**	**Assessment**	**Standards**
Resource availability has guided the development of human society. All forms of energy production and other resource extraction have associated economic, social, environmental, and geopolitical costs and risks as well as benefits. New technologies and social regulations can change the balance of these factors. Natural hazards and other geologic events have shaped the course of human history; [they] have significantly altered the sizes of human populations and have driven human migrations. The sustainability of human societies and the biodiversity that supports them requires responsible management of natural	How do the outcomes predicted by global climate models strongly depend on the amounts of human-generated greenhouse gases added to the atmosphere each year and by the ways in which these gases are absorbed by the ocean and biosphere? What are the associated economic, social, environmental, and geopolitical costs and risks as well as benefits of all forms of energy production and other resource extraction? How have natural hazards and other geologic events significantly altered the sizes of human populations and driven human migrations? What type of regulations and responsible	Analyze how natural resources, hazards, and climate change have influenced human activity Identify how changes in climate that can affect populations or drive mass migrations include changes to sea level, regional patterns of temperature and precipitation, and the types of crops and livestock that can be raised. Research alternative energy methods Compare extinction rates of the past to today. Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity. Graph real world data of changes in carbon in the atmosphere and predict possible outcomes. Interpret the effects of atmospheric and hydrologic cycles on human activity (severe	Research and describe how changes in atmospheric and hydrologic conditions cause long-term climatic changes. • Pollen Data Lab- demonstrate how plant life can indicate climate change • Ocean Sediment Core Sample Lab- Use microscopic diatoms to show paleoclimate and carbon concentrations Describe the carbon cycle, and identify carbon sinks, including atmospheric CO2, organic carbon, fossil fuels, and carbonate rocks. • Carbon Cycle Model Lab- Model the way carbon moves through each of Earth's 4 spheres • Vegetation's Impact on Coastal Runoff- compare run off rates of areas without vegetation areas to areas with vegetation		HS.ESS3.6.DCI.ESS3.D.2-Through computer simulations and other studies, important discoveries are still being made about how the ocean, the atmosphere, and the biosphere interact and are modified in response to human activities. (HS-ESS3-6) (09-12)[Regional:Next Generation Science Standards (NGSS)] HS.ESS3.6.CCC.1-When investigating or describing a system, the boundaries and initial conditions of the system need to be defined and their inputs and outputs analyzed and described using models. (HS-ESS3-6) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS3.6.DCI.ESS2.D.1-Current models predict that, although future regional climate changes will be complex and varied, average global temperatures will continue to rise. The outcomes predicted by global climate models strongly depend on the amounts of human-

resources. Scientists and engineers can make major contributions by developing technologies that produce less pollution and waste and that preclude ecosystem degradation. Humans have the abilities to model, predict, and manage current and future impacts. Important discoveries are still being made about how the ocean, the atmosphere, and the biosphere interact and are modified in response to human activities.	management of natural resources are needed to ensure the sustainability of human societies and biodiversity that supports them?	weather, floods, sea level changes, emergent and submergent coastlines, etc.). What it means to be sustainable and the measures we can take to achieve sustainability. Economics and environmental science are related. The government has developed regulations to protect our health and our environment. The media can distort information about the environment. Humanity benefits from biodiversity.	Graph real world data of changes in carbon in the atmosphere and predict possible outcomes. • Create a model of how rising sea levels will affect the world's population. • Glacier melt lab Use a variety of methods to model the different types of mining • Cookie mining lab Research current treatises and laws that have limited human impacts on the Earth. Prepare a claim or counterclaim in preparation for a class debate on the merit of the law or treaty. • Kyoto Protocol debate Describe renewable verses non-renewable. • Research alternative energy methods. Present to the class pros and cons		generated greenhouse gases added to the atmosphere each year and by the ways in which these gases are absorbed by the ocean and biosphere. (secondary to HS-ESS3-6) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS3.6-Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.* (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS3.4.CCC.1-Feedback (negative or positive) can stabilize or destabilize a system. (HSESS3-4) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS3.4.DCI.ETS1.B.2-When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts. (secondary to HS-ESS3-2),(secondary to HS-ESS3-4) (09-12)

					[Regional:Next Generation Science Standards (NGSS)] HS.ESS3.4.DCI.ESS3.C.1-Scientists and engineers can make major contributions by developing technologies that produce less pollution and waste and that preclude ecosystem degradation. (HS-ESS3-4) (09-12)[Regional:Next Generation Science Standards (NGSS)] HS.ESS3.4.SEP.1-Design or refine a solution to a complex real-world problem, based on scientific knowledge, student generated sources of evidence, prioritized criteria, and tradeoff considerations. (HS-ESS3-4) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS3.3.DCI.ESS3.C.1-The sustainability of human societies and the biodiversity that supports them requires responsible management of natural resources. (HS-ESS3-3) (09-12)[Regional:Next Generation Science Standards (NGSS)] HS.ESS3.3.CCC.1-Change and rates of change can be quantified and modeled over very

					short or very long periods of time. Some system changes are irreversible. (HS-ESS3-3) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS3.3-Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity. (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS3.2.DCI.ESS3.A.1-All forms of energy production and other resource extraction have associated economic, social, environmental, and geopolitical costs and risks as well as benefits. New technologies and social regulations can change the balance of these factors. (HS-ESS3-2) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS3.2.DCI.ETS1.B.2-When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to

					consider social, cultural, and environmental impacts. (secondary to HS-ESS3-2),(secondary to HS-ESS3-4) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS3.1.DCI.ESS3.B.2-Natural hazards and other geologic events have shaped the course of human history; [they] have significantly altered the sizes of human populations and have driven human migrations. (HS-ESS3-1) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS3.1.DCI.ESS3.A.1-Resource availability has guided the development of human society. (HS-ESS3-1) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS3.5.DCI.ESS3.D.1-Though the magnitudes of human impacts are greater than they have ever been, so too are human abilities to model, predict, and manage current and future impacts. (HS-ESS3-5) (09-12)[Regional:Next Generation Science Standards (NGSS)] HS.ESS3.5-Analyze

					geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems. (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS2.4.DCI.ESS2.D.3- The foundation for Earth's global climate systems is the electromagnetic radiation from the sun, as well as its reflection, absorption, storage, and redistribution among the atmosphere, ocean, and land systems, and this energy 's re-radiation into space. (HS-ESS2-4), (secondary to HS-ESS2-2) (09-12)[Regional:Next Generation Science Standards (NGSS)] HS.ESS2.4.DCI.ESS2.A.2- The geological record shows that changes to global and regional climate can be caused by interactions among changes in the sun's energy output or Earth's orbit, tectonic events, ocean circulation, volcanic activity, glaciers, vegetation, and human activities. These changes can occur on a variety of

					time scales from sudden (e.g., volcanic ash clouds) to intermediate (ice ages) to very long-term tectonic cycles. (HS-ESS2-4) (09-12)[Regional:Next Generation Science Standards (NGSS)] HS.ESS2.7.DCI.ESS2.E.2-The many dynamic and delicate feedbacks between the biosphere and other Earth systems cause a continual co-evolution of E arth's surface and the life that exists on it. (HSESS2-7) (09-12)[Regional:Next Generation Science Standards (NGSS)]
Plans:					

Title : Roxbury High School Geo-Physical Science Honors
Type : Consensus

Duration: May/Week 35 - June/Week 39					
UNIT NAME: Astronomy					
Enduring Understandings	**Essential Questions**	**Knowledge**	**Skills**	**Assessment**	**Standards**
Scientific knowledge grows and changes in light of new observations and new technological developments. Scientists employ modeling and mathematics to seek answers and solve problems. Space is big. Scientist knowledge of stars is based on modeling with limited observations. The contemporary models of the solar system are based on observation and deduction.	What is the universe, and what is Earth's place in it? What are Kepler's three laws of planetary motion? How does Newton's law of circular motion relate to the motion of Earth, Moon and Sun? How have scientific discoveries affected human perception of the earth? How are the sun, planets, and other parts of our solar system related? How are the physical properties of stars determined? What is the scientific theory of the origin of the universe? How do the activities of the sun affect Earth and its life? What evidence supports the Big Bang	Identify and describe the components of the solar system and the universe. Identify the evolution of the solar system and the information gleaned from the properties of the planets. Apply Kepler's Laws and Newton's Universal Law of Gravitation to planetary motion. Describe the Sun-Moon-Earth system. Relate knowledge of geologic processes and features on Earth to geologic processes and features on the moon. Communicate scientific ideas about the way stars, over their life cycle, produce elements. Describe the life cycle of stars (nebulae, protostar, red giants, white dwarfs, neutron stars, pulsars, supernovas, black holes), and the role of gravity in their stellar evolution.	Identify and describe the components of the solar system and the universe. • Scale the solar system activity as a class. Identify the evolution of the solar system and the information gleaned from the properties of the planets. • Planets Characteristic graphing lab. Apply Kepler's Laws and Newton's Universal Law of Gravitation to planetary motion. • Kepler's Law labs • Gravity lab Describe the Sun-Moon-Earth system. • Analyze the motions of the moon and interpret moon phases and eclipses • Model the effects of rotation and revolution of the Earth Relate knowledge of geologic processes and		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. (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS1.1.SEP.1-Develop a model based on evidence to illustrate the relationships between systems or between components of a system. (HSESS1-1) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS1.1.DCI.ESS1.A.1-The star called the sun is changing and will burn out over a lifespan of approximately 10 billion years. (HSESS1-1) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS1.1.DCI.PS3.D.2-Nuclear Fusion processes in the center of the sun release the energy that ultimately reaches Earth as radiation. (secondary to

	Theory? How is the Universe organized? What are the different types of galaxies and their properties?	Describe the role of solar weather on Earth-based technologies 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. Describe the structure and evolution of galaxies using their visible characteristics	features on Earth to geologic processes and features of the moon. • Analyze the features of the moon. Use Laws of cross-cutting and superposition to identify relative ages of craters, maria, and rays. Communicate scientific ideas about the way stars, over their life cycle, produce elements. Describe the life cycle of stars and the role of gravity in their stellar evolution. • HR Diagram • Stellar Evolution Branching Diagram lab Describe the role of solar weather on Earth-based technologies. 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. • Determine the rate of expansion by graphing the hubble constant.		HS-ESS1-1) (09-12) [Regional:Next Generation Science Standards (NGSS)] 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. (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS1.2.SEP.1-Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' ow n investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (HS-ESS1-2) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS1.2.CNS.2-Scientific knowledge is based on the assumption that natural laws operate today as they did in the past and they will continue to do so in the future. (HS-ESS1-2) (09-12)

			• Big Bang Expansion - Balloon lab Describe the structure and evolution of galaxies using their visible characteristics. • Advanced Galaxy classification and evolution diagram		[Regional:Next Generation Science Standards (NGSS)] HS.ESS1.2.DCI.ESS1.A.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) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS1.2.DCI.ESS1.A.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) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS1.2.DCI.PS4.B.4-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) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS1.2.CET.1- Science and engineering complement each other in the cycle known as research and development (R&D). Many R&D projects may involve scientists, engineers, and others with wide ranges of expertise. (HSESS1-2), (HS-ESS1-4) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS1.3.DCI.ESS1.A.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) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS1.3.DCI.ESS1.A.2- 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) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS1.6.SEP.1-Apply scientific reasoning to link evidence to the claims to assess the extent to which the reasoning and data support the explanation or conclusion. (HS-ESS1-6) (09-12)[Regional:Next Generation Science Standards (NGSS)] HS.ESS1.6.CNS.1-A scientific theory is a substantiated explanation of some aspect of the natural world, based on a body of facts that have been repeatedly confirmed through observation and experiment and the science community validates each theory before it is accepted. If new evidence is discovered that the theory does not accommodate, the theory is generally modified in light of this new evidence. (HS-ESS1-6) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.ESS1.6.DCI.ESS1.C.1-Although active geologic processes, such as plate

					tectonics and erosion, have destroy ed 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 y ears. Studying these objects can provide information about Earth's formation and early history . (HS-ESS1-6) (09-12) [Regional:Next Generation Science Standards (NGSS)]
Plans:					