# ORION'S QUEST MISSION NGSS MATRIX

e = mission suited for extension activities

| | | Worms in Space | Silicate Gardens | Butterflies in Space | Fruit Flies in Space | MESA Mission - Wee Worms in Space | Spiders in Space | Plant Growth in Space | Managing Microbes in Space | Stem on Station | Stem Cell Studies on Station | CuRE in Space - Cancer Micro-gravity Research Experiment | Worms in Space 2.0 | Space AGE Edcuation |
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| **DCIs - Disciplinary Core Ideas - HIGH SCHOOL** | | | | | | | | | | | | | | |
| **Earth and Space Science** (basis of all missions) | | | | | | | | | | | | | | |
| | **Earth's Place in the Universe** | | | | | | | | | | | | | |
| | **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 | e | e | e | e | e | e | e | e | e | e | e | e | e |
| | **HS-ESS1-3.** Communicate scientific ideas about the way stars, over their life cycle, produce elements. | | e | | | | | | | | | | | |
| | **HS-ESS1-4.** Use mathematical or computational representations to predict the motion of orbiting objects in the solar system. | e | e | e | e | e | e | e | e | e | e | e | e | e |
| | **Earth and Human Activity** | | | | | | | | | | | | | |
| | **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. | | | | | | | e | | | | | | |
| **Life Science** | | | | | | | | | | | | | | |
| | **Molecules to Organisms: Structures and Processes** | | | | | | | | | | | | | |
| | **HS-LS1-2.** Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. | | | X | | | X | X | | X | X | X | | X |
| | **HS-LS1-3.** Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. | | | X | | | | X | | | | | | e |
| | **HS-LS1-5.** Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy. | | | e | | | | e | | | | | | |
| | **Ecosystems: Interactions, Energy, and Dynamics** | | | | | | | | | | | | | |
| | **HS-LS2-1.** Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales. | e | | e | e | e | e | e | e | e | e | e | e | |
| | **HS-LS2-2.** Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales. | | | e | e | | e | e | | | | | | |
| | **HS-LS2-4**. Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem. | e | | e | e | e | e | e | e | | | | | |
| | **HS-LS2-6.** Evaluate claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem. | X | | X | X | X | X | X | X | | | | | x |
| | **HS-LS2-8.** Evaluate evidence for the role of group behavior on individual and species' chances to survive and reproduce. | X | | X | X | X | X | | X | | | X | | |
| | **Heredity: Inheritance and Variation of Traits** | | | | | | | | | | | | | |
| | **HS-LS3-2.** Make and defend a claim based on evidence that inheritable genetic variations may result from (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors. | X | | X | | X | | | X | | | | | |
| | **Biological Evolution: Unity and Diversity** | | | | | | | | | | | | | |

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| | **HS-LS4-2.** Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment. | | | e | | | | | | | | | | |
| | **HS-LS4-6.** Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity. | | | e | | | | | | | | | | |
| **Physical Science** | | | | | | | | | | | | | | |
| | **Matter and Its Interactions** | | | | | | | | | | | | | |
| | **HS-PS1-1.** Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms. | | X | | | | | | | | | | | |
| | **HS-PS1-2.** Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties. | | X | | | | | | | | | | | |
| | **HS-PS1-3.** Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles. | | e | | | | | | | | | | | |
| | **HS-PS1-5.** Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs. | | X | | | | | | | | | | | |
| | **HS-PS1-6.** Refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium. | | e | | | | | | | | | | | |
| | **HS-PS1-7.** Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction. | | X | | | | | | | | | | | |
| | **Motion and Instability** | | | | | | | | | | | | | |
| | **HS-PS2-6.** Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials. | | e | | | | | | | | | | | |
| **Engineering Design Process** | | | | | | | | | | | | | | |
| | **HS-ETS1-1.** Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants. | e | e | e | e | e | e | e | e | e | e | e | | |
| | **HS-ETS1-2.** Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering. | X | X | X | X | X | X | X | X | X | X | X | X | X |
| | **HS-ETS1-3.** Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts. | X | X | X | X | X | X | X | X | X | X | X | | e |
| **DCIs MIDDLE SCHOOL - Disciplinary Core Ideas** | | | | | | | | | | | | | | |
| **Earth and Space Science** (basis of all missions) | | | | | | | | | | | | | | |
| | **Earth's Place in the Universe** | | | | | | | | | | | | | |
| | **MS-ESS1-1.** Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons. | e | e | e | e | e | e | e | e | e | e | e | e | e |
| | **MS-ESS1-2.** Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system. | X | X | X | X | X | X | X | X | X | X | X | e | e |
| | **Earth's Systems** | | | | | | | | | | | | | |
| | **MS-ESS2-3.** Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions. | | | | | | | e | | | | | | |
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| | **Earth and Human Activity** | | | | | | | | | | | | | |
| | **MS-ESS3-5.** Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century. | | e (cement production) | | | | | | | | | | | |

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| **Life Science** | | | | | | | | | | | | | | |
| | **Molecules to Organisms: Structures and Processes** | | | | | | | | | | | | | |
| | **MS-LS1-1.** Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells. | e | | e | e | e | e | e | e | X | X | X | X | X |
| | **MS-LS1-2.** Develop and use a model to describe the function of a cell as a whole and ways the parts of cells contribute to the function. | | | | | | | | | X | X | X | e | e |
| | **MS-LS1-3.** Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells. | e | | e | e | e | e | e | e | e | e | e | e | e |
| | **MS-LS1-5.** Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms. | X | | X | X | X | X | X | X | | | | e | e |
| | **MS-LS1-6.** Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms. | | | | | | | e | | | | | | |
| | **Ecosystems: Interactions, Energy, and Dynamics** | | | | | | | | | | | | | |
| | **MS-LS2-4.** Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations. | X | X | X | X | X | X | X | X | X | X | X | | X |
| | **MS-LS2-5.** Evaluate competing design solutions for maintaining biodiversity and ecosystem services. | | | X | e | | e | X | | | | | | |
| | **Biological Evolution: Unity and Diversity** | | | | | | | | | | | | | |
| | **MS-LS4-4.** Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment. | | | e | | | | | | | | | | |
| **Physical Science** | | | | | | | | | | | | | | |
| | **Matter and Its Interactions** | | | | | | | | | | | | | |
| | **MS-PS1-1.** Develop models to describe the atomic composition of simple molecules and extended structures. | | X | | | | | | | | | | | |
| | **MS-PS1-2.** Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred. | | X | | | | | | | | | | | |
| | **MS-PS1-3.** Gather and make sense of information to describe that synthetic materials come from natural resources and impact | | X | | | | | | | | | | | |
| | **MS-PS1-4.** Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed. | X (convection - ground only) | | | | | | | | | | | | |
| | **MS-PS1-5.** Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved. | | X | | | | | | | | | | | |
| | **MS-PS1-6.** Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes. | | e | | | | | | | | | | | |
| | **Motion and Instability** | | | | | | | | | | | | | |
| | **MS-PS2-2.** Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object. | e | e | e | e | e | e | e | e | e | e | e | e | |
| | **MS-PS2-4.** Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects. | X | X | X | X | X | X | X | X | X | X | X | | |
| | **MS-PS2-5.** Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in | e | e | e | e | e | e | e | e | e | e | e | | |
| | **Waves and their Application in Technologies for Information Transfer** | | | | | | | | | | | | | |
| | **MS-PS4-3.** Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals. | e | e | e | e | e | e | e | e | e | e | e | | |
| **Engineering Design Process** | | | | | | | | | | | | | | |

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| | **MS-ETS1-1.** Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible | X | X | X | X | X | X | X | X | X | X | X | X | X |
| | **MS-ETS1-2.** Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. | | | X | | | | X | | | | | | |
| | **MS-ETS1-3.** Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success. | | | X | | | | X | | | | | | |
| | **MS-ETS1-4.** Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved. | | | X | | | | X | | | | | | |
| **SEPs - Science and Engineering Practices - all levels** | | | | | | | | | | | | | | |
| | Asking questions (for science) & defining problems (for engineering) | X | X | X | X | X | X | X | X | X | X | X | X | X |
| | Developing & using models | X | X | X | X | X | X | X | X | X | X | X | X | X |
| | Planning and carrying out investigati& | | X | X | | | | X | | | | | | |
| | Analyzing & interpreting data | X | X | X | X | X | X | X | X | X | X | X | X | X |
| | Using mathematics & computational thinking | | | | | | | | X | X | X | X | X | X |
| | Constructing explanations (science) & designing solutions (engineeri | X | X | X | X | X | X | X | X | X | X | X | X | X |
| | Engaging in argument from evidence | X | X | X | X | X | X | X | X | X | X | X | X | X |
| | Obtaining, evaluating, & communicating information | X | X | X | X | X | X | X | X | X | X | X | X | X |
| **CCCs - Cross Cutting Concepts - all levels** | | | | | | | | | | | | | | |
| | Patterns | X | X | X | X | X | X | X | X | X | X | X | X | X |
| | Cause & effect | X | X | X | X | X | X | X | X | X | X | X | X | X |
| | Scale, proportion, & quantity | X | X | X | X | X | X | X | X | X | X | X | X | X |
| | Systems & system models | X | X | X | X | X | X | X | X | X | X | X | X | X |
| | Energy & matter | e | X | e | e | e | e | e | e | e | e | e | | |
| | Structure & function | X | X | X | X | X | X | X | X | X | X | X | X | X |
| | Stability & change | X | X | X | X | X | X | X | X | X | X | X | X | X |
| rev.2019 | | | | | | | | | | | | | | |