Unit 1: 802 Force and Motion

Content Area: **Science**
Course(s):
Time Period: **1st Marking Period**
Length: **6-8 weeks**
Status: **Not Published**

Summary of the Unit

Students use *system and system models* and *stability and change* to understanding ideas related to why some objects will keep moving and why objects fall to the ground. Students apply Newton's third law of motion to related forces to explain the motion of objects. Students also apply an engineering practice and concept to solve a problem caused when objects collide. The crosscutting concepts of *system and system models* and *stability and change* provide a framework for understanding the disciplinary core ideas. Students demonstrate proficiency in *asking questions*, *planning and carrying out investigations, designing solutions, engaging in argument from evidence*, *developing and using models,* and *constructing explanations and designing solutions*. Students are also expected to use these practices to demonstrate understanding of the core ideas.

SCI.MS-PS2-3	Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.
SCI.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.
SCI.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 contact.
SCI.MS-PS2-1	Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.
SCI.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.

Enduring Understanding

- Newton's second law of motion (F=ma) and the conservation of momentum can be used to predict changes in the motion of macroscopic objects.

• Newton's law of universal gravitation and Coulomb's law provide the mathematical models to describe and predict the effects of gravitational and electrostatic forces between distant objects.

• Forces at a distance are explained by fields (gravitational, electric, and magnetic) permeating space that can transfer energy through space. Magnets or electric currents cause magnetic fields; electric charges or changing magnetic fields cause electric fields.

• Attraction and repulsion between electric charges at the atomic scale explain the structure, properties, and transformations of matter, as well as the contact forces between material objects.

• "Electrical energy" may mean energy stored in a battery or energy transmitted by electric currents.

• Conservation of energy means that the total change of energy in any system is always equal to the total energy transferred into or out of the system. When two objects interacting through a field change relative position, the energy stored in the field is changed.

• Energy cannot be created or destroyed, but it can be transported from one place to another and transferred between systems.

• Mathematical expressions, which quantify how the stored energy in a system depends on its configuration (e.g., relative positions of charged particles, compression of a spring) and how kinetic energy depends on mass and speed, allow the concept of conservation of energy to be used to predict and describe system behavior.

• The availability of energy limits what can occur in any system.

• Uncontrolled systems always evolve toward more stable states—that is, toward more uniform energy distribution (e.g., water flows downhill, objects hotter than their surrounding environment cool down).

• Momentum is defined for a particular frame of reference; it is the mass times the velocity of the object.

• If a system interacts with objects outside itself, the total momentum of the system can change; however, any such change is balanced by changes in the momentum of objects outside the system

• Mathematical expressions, which quantify how the stored energy in a system depends on its configuration (e.g., relative positions of charged particles, compression of a spring) and how kinetic energy depends on mass and speed, allow the concept of conservation of energy to be used to predict and describe system behavior.

• The availability of energy limits what can occur in any system.

• Uncontrolled systems always evolve toward more stable states—that is, toward more uniform energy distribution (e.g., water flows downhill, objects hotter than their surrounding environment cool down).

• 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.

Essential Questions

1. Can a force be applied on something without touching it and if so, how is it measured?

2. How can force change an object's motion.

3. How does friction change the motion of an object?

4. What affects the strength of gravitational forces?

5. What factors affect the strength of electric and magnetic forces?

6. If air resistance is eliminated and two objects of different mass/ size were dropped at the same time, which would land first? How can that be explained?

7. How is momentum conserved?

8. How does Newton's Third Law relate to force pairs?

9. Why does an object begin moving, stay moving or remain stationary?

Summative Assessment/Summative Criteria

Quarterly assessments per marking period, end of unit assessments (tests, quizzes, labs, activities).

Resources

Textbooks/workbooks

Mosa Mack

Discovery Ed

Achieve 3000

Lab materials (varies)

Brain Pop

Chromebooks/Ipads

See Instructional Activities/websites under Units for Curriculum.

Unit Plan

Topic Selection /Timeframe	Content	General Objectives	Instructional Activities
Forces and Motion 19 Days	Motion & Measuring Motion Average speed Acceleration Net Force Balanced & Unbalanced Forces Types of Forces Contact & Non contact forces Friction	Describe motion and how reference points affect your description. Construct and analyze graphs to understand speed and motion. Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the	With a still object, discuss all of the forces acting on the object and why they are equal. Calculating Average Speed Lab: https://docs.google.com/document/d/1I6256FED3KgwiTKR-3ldcBBdGN Bjszeca5NYJM/edit?usp=sharing NSTA Forces and Motion Workbook http://static.nsta.org/files/PB295Xweb.pdf Stations, Types of Friction Lab: https://docs.google.com/document/d/1tesXhhg_r67rX_2WqYQdOqoKxIVoXgVoHOnICvjHO0o/edit?usp=s Why Satellites Don't Fall To The Ground: http://fearofphysics.com/Satellite/satellite.html Cannonball Gravity: http://highered.mheducation.com/olcweb/cgi/pluginpop.cgi?it=swf::800::600::/sites/dl/free/00724826 Nav.swf::Gravity+Variations+Interactive Mini-lab: Gravity vs Air Resistance, observing a flat sheet of paper vs a crumbled sheet falling :

	Gravity	forces on the object and the mass of the object Investigate how any change in speed or direction must be the result of an unbalanced force. Plan and carry out investigations to answer questions about forces, motion and direction changes. Conduct an investigation a nd evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact. Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses and distance of interacting objects. Design an investigation that shows friction is a force that opposes motion.	https://docs.google.com/document/d/1nn7sJx4-SKb-TsX65v_-QkFWGODNjHucd3KNVVByM-c/edit?usp= Mosa Mack Units: Force and Motion, Gravity

Electrostatic & Magnetic forces 13 Days	Magnetism Types of magnets Electromagnets Coulomb's Law Electrostatic forces	Describe how electrons at the atomic level create a magnetic field. Construct an electromagnet. Make observations and draw conclusions about the relationship between magnetism and electricity	Coulomb's Law: https://phet.colorado.edu/en/simulation/coulombs-law Examples of Electrostatic Forces: https://phet.colorado.edu/en/simulation/john-travoltage https://phet.colorado.edu/sims/html/balloons-and-static-electricity/latest/balloons-and-static-electricity_ Mosa Mack Unit: Electricity
Newton's Laws of Motion 14 Days	Newton's 1st Law Inertia Newton's second law Newton's 3rd Law Collisions Momentum	Predicting the motion of an object using Newton's first law of motion. Predicting the inertia of an object based on an objects mass. Calculate an objects force, mass, & acceleration using Newton's second law. Plan an investigation applying Newton's first and second laws of motion Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.	Penny/car crash test http://ilovescience.ihmc.us/Activities/MomentumCrash/MomentumCrashTestActivit http://www.physicsclassroom.com/Physics-Interactives/Momentum-and-Collisions/Collision-Carts/Collisi 2 Simulator http://www.physicsclassroom.com/Physics-Interactives/Momentum-and-Collisions/Collision-Carts/Collisi Interactive Apply Newton's third law to design a solution to a problem involving the motion of two colliding objects. Sports and Physics: chose a sport to analyze Newton's 3 Laws. Create a poster showing each law as a pa

Suggested Modifications for Spec Ed, ESL, and Gifted Students

*Consistent with individual plans, when appropriate.
• Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.
• Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).
• Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).
• Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).
• Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.
• Use project-based science learning to connect science with observable phenomena.
• Structure the learning around explaining or solving a social or community-based issue.
• Provide ELL students with multiple literacy strategies.
• Collaborate with after-school programs or clubs to extend learning opportunities.
• Restructure lesson using UDL principals (http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA)

Suggested Technological Innovations/Use

Use of Chromebooks, Google Classroom, Web-quests, Google Forms, LinkIt, Achieve 3000

Cross Curricular/21st Century Connections

9.1 21st Century Life and Career Skills: All students will demonstrate the creative, critical thinking, collaboration, and problem-solving skills needed to function successfully as both global citizens and workers in diverse ethnic and organizational cultures.
9.2 21st Century Life and Career Skills: Personal Financial Literacy: All students will develop skills and strategies that promote personal and financial responsibility related to financial planning, savings, investment, and charitable giving in the global economy. 9.3 21st Century Life and Career Skills: Career Awareness, Exploration, and Preparation: All students will apply knowledge about and engage in the process of career awareness, exploration, and preparation in order to navigate the globally competitive work environment of the information age.

English Language Arts
• Cite specific textual evidence to support analysis of science and technical texts, attending to the precise

details of explanations or descriptions of the application of Newton's third law involving the motion of two colliding objects.
• Follow precisely a multistep procedure when carrying out experiments to apply Newton's third law when designing a solution to a problem involving the motion of two colliding objects, taking measurements, or performing technical tasks.
• Follow precisely a multistep procedure when performing an investigation that provides 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, taking measurements or performing technical tasks.
• Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading texts about the application of Newton's third law to the motion of two colliding objects Conduct a short research project to answer a question about the application of Newton's third law when designing a solution to a problem involving the motion of two colliding objects, drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.
• Conduct a short research project to answer a question about how the sum of the forces on the object and the mass of the object change an object's motion, drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.
• Gather relevant information from multiple print and digital sources that provide information about the application of Newton's third law when designing a solution to a problem involving the motion of two colliding objects; assess the credibility of each source and quote or paraphrase the data and conclusions of others while avoiding plagiarism and providing basic bibliographic information for sources.
• Draw evidence from informational texts to support analysis, reflection, and research about the application of Newton's third law when designing a solution to a problem involving the motion of two colliding objects.
• Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. (MS-PS2-1),(MS-ETS1-1),(MS-ETS1-2) RST.6-8.1
• Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. (MS-PS2-1),(MS-PS2-2) RST.6-8.3
• Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. (MS-ETS1-1) WHST.6-8.8
• Draw evidence from informational texts to support analysis, reflection, and research. (MS-ETS1-2) WHST.6-8.9
• Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. (MS-ETS1-2),(MS-ETS1-3) RST.6-8.9
• Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. (MS-ETS1-2) WHST.6-8.7

Mathematics
• Reason abstractly and quantitatively when collecting and analyzing data about the application of Newton's third law in the course of designing a solution to a problem involving the motion of two colliding objects.
• Analyze data in the form of numbers and symbols to draw conclusions about how the sum of the forces on an object and the mass of an object change the object's motion.
• Understand that positive and negative numbers are used together to describe quantities having opposite directions or values; use positive and negative numbers to represent quantities in a design that applies Newton's third law to a problem involving the motion of two colliding objects.
• When collecting and analyzing data from investigations about how the sum of the forces on an object and the mass of the object changes the object's motion, write, read, and evaluate expressions in which letters stand for numbers.
• Reason abstractly and quantitatively. (MS-PS2-1),(MS-PS2-2),(MS-PS2-3),(MS-ETS1-1),(MS-ETS1-2) MP.2
• Understand that positive and negative numbers are used together to describe quantities having opposite directions or values; use positive and negative numbers to represent quantities in real-world contexts,

explaining the meaning of 0 in each situation. (MS-PS2-1) 6.NS.C.5
• Write, read, and evaluate expressions in which letters stand for numbers. (MS-PS2-1),(MS-PS2-2) 6.EE.A.2
• Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form, using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. (MS-PS2-1),(MS-PS2-2) 7.EE.B.3
• Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities. (MS-PS2-1),(MS-PS2-2) 7.EE.B.4
• Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. (MS-ETS1-1),(MS-ETS1-2) 7.EE.3
Connections to the Nature of Science
Systems and System Models
Models can be used to represent systems and their interactions—such as inputs, processes and outputs—and energy and matter flows within systems. (MS-PS2-1) Stability and Change
Explanations of stability and change in natural or designed systems can be constructed by examining the changes over time and forces at different scales. (MS-PS2-2) Connections to Engineering, Technology, and Applications of Science Influence of Science, Engineering, and Technology on Society and the Natural World
The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. (MS-PS2-1)
All human activity draws on natural resources and has both short and long-term consequences, positive as well as negative, for the health of people and the natural environment. (MS-ETS1-1)

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Unit 2: 802 Earth's place in the Universe

Content Area: **Science**
Course(s):
Time Period: **Sample Time Period**
Length: **2 weeks**
Status: **Not Published**

Summary of the Unit

This unit is broken down into three sub-ideas: the universe and its stars, Earth and the solar system, and the history of planet Earth. Students examine the Earth's place in relation to the solar system, the Milky Way galaxy, and the universe. There is a strong emphasis on a systems approach and using models of the solar system to explain the cyclical patterns of eclipses, tides, and seasons. There is also a strong connection to engineering through the instruments and technologies that have allowed us to explore the objects in our solar system and obtain the data that support the theories explaining the formation and evolution of the universe. Students examine geosciences data in order to understand the processes and events in Earth's history. The crosscutting concepts of *patterns*, *scale, proportion, and quantity* and *systems and systems models* provide a framework for understanding the disciplinary core ideas. Students are expected to demonstrate proficiency in *developing and using models* and *analyzing and interpreting data*. Students are also expected to use these practices to demonstrate understanding of the core ideas.

SCI.MS-ESS1-2	Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.
6-8.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.

Enduring Understanding

1. Gravity from matter in the universe is the catylist for moon, planet, star, and galaxy formation.

2. Solar activity creates the elements through nuclear fusion.

3. The development of technologies has provided astronomical data that provide empirical evidence for the Big Bang theory.

4. Kepler’s Laws describe common features of the motions of orbiting objects.

5. Observations from astronomy and space probes provide evidence for explanations of solar system formation.

6. Changes in Earth’s tilt and orbit cause climate changes such as ice ages.

Essential Questions

1. Why does the Sun’s apparent motion across the sky change over the course of a year?

2. Why does the Earth-sun-moon system describe the cyclic patterns of lunar phases, eclipses of the sun and

moon, and seasons?

3. Why does gravity cause smaller objects to orbit around larger objects?

4. What is the role of gravity in the motions within galaxies and the solar system?

5. What is the role of gravity in the formation of moons, planets, and stars.

Summative Assessment /Summative Criteria

Quarterly assessments per marking period, end of unit assessments (tests, quizzes, labs, activities).

Resources

Textbooks/workbooks

Mosa Mack

Discovery Ed

Achieve 3000

Lab materials (varies)

Brain Pop

Chromebooks/Ipads

See Instructional Activities/websites under Units for Curriculum.

Unit Plan w/Associated Standards (chart)

Topic Selection/ Time Frame	Content	General Objectives	Instructional Activities
Earth's Place in the Universe	Nebulas	Describe star, planet and moon formation in a nebula and the role gravity plays in	-Solar System formation timeline activity

13 Days		the process.	
	Gravity & mass	Use a model to understand how gravity affects objects with different masses.	Activity- Using models, students will complete a hands on lab modeling the moon as viewed from ea to determine moon phases as well as predict eclipses as the moon progresses around Earth -Students will create brief notes and drawings on moon phases and causes.
	Moon, planet, star formation	Describe the relationship between size, mass and density of objects in accordance with their gravitational pull.	- Seasons Interactive from NASA http://highered.mheducation.com/sites/007299181x/student_view0/chapter2/seasons_interac e.html - Eclipse Interactive from NASA http://highered.mheducation.com/sites/007299181x/student_view0/chapter9/eclipse_interact .html#
	Orbital & planetary formation due to gravity		Activity- Modeling ellipses lab (students will use cardboard, push pins, rubber bands to show how wh focus points are separated, ellipses become more eccentric)
	Gravitational pull, mass, weight	Based on objects with familiar sizes, are there larger or smaller objects in the known universe?	Activity- http://www.galaxy.net/~k12/space/flyaway.shtml Activity-http://www.lpi.usra.edu/education/explore/solar_system/activities/bigKid/planetPull/ (The P of the Planets - NJ model curriculum)
	Lunar phases & eclipses	Analyze data to describe the cyclic pattern of the lunar phases.	- Orbiting Marbles Lab (students will use paper plates, marbles, and scissors to show how if an orbit disrupted, planetary motion continues in a straight line) Your weight on other planets: http://www.exploratorium.edu/ronh/weight/
	Seasons and tides	Analyze the Moon's appearance in relation to the lunar cycle.	http://htwins.net/scale2/ Students will differentiate between size and scale of observable and known objects in the universe using the website to complete a web-quest. Mosa Mack Unit: Sun-Earth System and Solar System Gravity
		Develop amodel to represent the Sun-Earth-Moon system's effect on tides	

Suggested Modifications for Special Education, ELL and Gifted Students

*Consistent with individual plans, when appropriate.

Restructure lesson using UDL principals (http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA); Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.; Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).; Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).; Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).; Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.; Use project-based science learning to connect science with observable phenomena.; Structure the learning around explaining or solving a social or community-based issue.; Provide ELL students with multiple literacy strategies. ; Collaborate with after-school programs or clubs to extend learning opportunities. English Language Learners - Websites with various language options.

Suggested Technological Innovations/Use

Use of Chromebooks, Google Classroom, Web-quests, Google Forms, LinkIt, Achieve 3000

Cross Curricular/21st Century Connection

9.1 21st Century Life and Career Skills: All students will demonstrate the creative, critical thinking, collaboration, and problem-solving skills needed to function successfully as both global citizens and workers in diverse ethnic and organizational cultures.
9.2 21st Century Life and Career Skills: Personal Financial Literacy: All students will develop skills and strategies that promote personal and financial responsibility related to financial planning, savings, investment, and charitable giving in the global economy.
9.3 21st Century Life and Career Skills: Career Awareness, Exploration, and Preparation: All students will apply knowledge about and engage in the process of career awareness, exploration, and preparation in order to navigate the globally competitive work environment of the information age.

Unit 3: 802 Kinetic & Potential Energy

Content Area: **Sample Content Area**
Course(s):
Time Period: **Sample Time Period**
Length: **Sample Length**
Status: **Not Published**

Summary of the Unit

In this unit, students use the practices of analyzing and interpreting data, developing and using models, and engaging in argument from evidence to make sense of relationship between energy and forces. Students develop their understanding of important qualitative ideas about the conservation of energy. Students understand that objects that are moving have kinetic energy and that objects may also contain stored (potential) energy, depending on their relative positions. Students also understand the difference between energy and temperature, and the relationship between forces and energy. The crosscutting concepts of scale, proportion, and quantity, systems and system models, and energy and matter are called out as organizing concepts for these disciplinary core ideas. Students use the practices of analyzing and interpreting data, developing and using models, and engaging in argument from evidence. Students are also expected to use these practices to demonstrate understanding of the core ideas.
This unit is based on MS-PS3-1, MS-PS3-2, and MS-PS3-5.

Enduring Understandings

Energy is a quantitative property of a system that depends on the motion and interactions of matter and radiation within that system. That there is a single quantity called energy is due to the fact that a system's total energy is conserved, even as, within the system, energy is continually transferred from one object to another and between its various possible forms.
• At the macroscopic scale, energy manifests itself in multiple ways, such as in motion, sound, light, and thermal energy. These relationships are better understood at the microscopic scale, at which all of the different manifestations of energy can be modeled as a combination of energy associated with the motion of particles and energy associated with the configuration (relative position of the particles).
• In some cases, the relative position of energy can be thought of as stored in fields (which mediate interactions between particles). This last concept includes radiation, a phenomenon in which energy stored in fields moves across space.
• Mathematical expressions, which quantify how the stored energy in a system depends on its configuration (e.g., relative positions of charged particles, compression of a spring) and how kinetic energy depends on mass and speed, allow the concept of conservation of energy to be used to predict and describe system behavior.
• The availability of energy limits what can occur in any system.
• Uncontrolled systems always evolve toward more stable states—that is, toward more uniform energy distribution (e.g., water flows downhill, objects hotter than their surrounding environment cool down).
• Attraction and repulsion between electric charges at the atomic scale explain the structure, properties, and transformations of matter, as well as the contact forces between material objects.

Essential Questions

1. How do we know that things have energy?

2. How are work and energy related?

3. How does the potential energy of an object affect the amount of kinetic energy it has?

4. How can physics be used to explain various phenomena in sports?

5. Once a ball is thrown from rest, how does its energy change from kinetic to potential and back to kinetic without touching the ball after it is released from your hand?

6. What happens to the energy in a system – where does this energy come from, how is it changed within the system, and where does it ultimately go?

Summative Assessment and/or Summative Criteria

Quarterly assessments per marking period, end of unit assessments (tests, quizzes, labs, activities).

Resources

Textbooks/workbooks

Mosa Mack

Discovery Ed

Achieve 3000

Lab materials (varies)

Brain Pop

Chromebooks/Ipads

See Instructional Activities/websites under Units for Curriculum.

Unit Plan

Topic/Selection Timeframe	Content	General Objectives	Instructional Activities	Benchmarks /Assessments	Standards
Potential & Kinetic energy 13 Days	What is Energy? What is work? Joules Kinetic Energy Calculating KE Potential Energy Gravitational PE Elastic PE	Construct and interpret graphical displays of data to describe the relationship between kinetic energy, mass, and speed. Compile data to support the claim that an energy transfer is responsible for changes in kinetic energy Evaluate how the length of the stretch/compression affects the amount of potential energy of an object.	Rubber bands and science- Graph energy based on mass of rubber bands Using a ruler: measure the stretch (potential energy) and the distance shot (kinetic energy) to determine correlations at different stretch points and different rubber band thickness. http://www.kidsdiscover.com/teacherresources/a-lesson-in-potential-and-kinetic-energy/ Roll different size objects down an inclined plane to graph mass vs time to roll to a specific point. Marble drop: http://betterlesson.com/lesson/resource/3174347/energy-transfer-kinetic-energy-labs-student-document?from=resource_image Pendulum Science: https://www.teachengineering.org/lessons/view/cub_energy_lesson01 Rubber bands and science- Using a ruler: measure the stretch (potential energy) and the distance shot (kinetic energy) to determine correlations at different stretch points and different rubber band thickness. http://www.kidsdiscover.com/teacherresources/a-lesson-in-potential-and-kinetic-energy/ Mosa Mack: Potential and Kinectic Energy Unit	Quarterly Assessments - Portfolio Assessments - Section Quizzes - Chapter Tests - Concept Practical using hands on problems and examples. -Google Slides Presentations -Lab Reports - Worksheets	(MS-PS3-1) (MS-PS3-2) (MS-PS3-5)

				-Mosa Mack	
Energy Transformations 13 Days	Other Forms of Energy Law of Conservation of Energy TEin = TEout Momentum Collisions Dissipated Energy	Distinguish between energy transfer and energy transformation Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object. Observe the transformation of kinetic energy into electric energy in a generator. Illustrate how Chemical Potential Energy in Food is transformed into kinetic and heat energy.	Pendulum Analysis, include test bite at the bottom of the page: http://www.bbc.co.uk/schools/gcsebitesize/science/add_aqa/kinetic_energy/forcesenergyrev5.shtml Activity Guide: https://www.dcmp.org/guides/TID7457.pdf Newton's Cradle: http://science.howstuffworks.com/innovation/inventions/newtons-cradle4.htm Roller Coaster Creator: https://assets.jason.org/resource_assets/4851/8673/coaster.html	Quarterly Assessments - Portfolio Assessments - Section Quizzes - Chapter Tests - Concept Practical using hands on problems and examples. -Google Slides Presentations -Lab Reports - Worksheets	(MS-PS3-1) (MS-PS3-2) (MS-PS3-5)

Suggested Modifications for Special Education, ELL and Gifted Students

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Restructure lesson using UDL principals (http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA); Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.; Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).; Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).; Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).; Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.; Use project-based science learning to connect science with observable phenomena.; Structure the learning around explaining or solving a social or community-based issue.; Provide ELL students with multiple literacy strategies. ; Collaborate with after-school programs or clubs to extend learning opportunities. English Language Learners - Websites with various language options.

Suggested Technological Innovations/Use

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Cross Curricular/21st Century Connections

9.1 21st Century Life and Career Skills: All students will demonstrate the creative, critical thinking, collaboration, and problem-solving skills needed to function successfully as both global citizens and workers in diverse ethnic and organizational cultures.
9.2 21st Century Life and Career Skills: Personal Financial Literacy: All students will develop skills and strategies that promote personal and financial responsibility related to financial planning, savings, investment, and charitable giving in the global economy. 9.3 21st Century Life and Career Skills: Career Awareness, Exploration, and Preparation: All students will apply knowledge about and engage in the process of career awareness, exploration, and preparation in order to navigate the globally competitive work environment of the information age.
English Language Arts/Literacy
• Cite specific textual evidence to support analysis of science and technical texts that describe the relationships of kinetic energy to the mass of an object and to the speed of an object, attending to the precise details of explanations or descriptions.
• Integrate quantitative or technical information that describes the relationship of kinetic energy to the mass of an object and to the speed of object that is expressed in words with a version of that information expressed visually in a flowchart, diagram, model, graph, or table.
• Integrate multimedia and visual displays into presentations that describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system to clarify information, strengthen claims and evidence, and add interest.
• Cite specific textual evidence to support analysis of science and technical texts to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object, attending to the precise details of explanations or descriptions.
• Write arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.
• Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. (MS-PS3-1),(MS-PS3-5) RST.6-8.1
• Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-PS3-1) RST.6-8.7
• Write arguments focused on discipline content. (MS-PS3-5) WHST.6-8.1

• Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. (MS-PS3-3) WHST.6-8.7
• Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-PS3-2) SL.8.5
Mathematics
• Reason abstractly and quantitatively by interpreting numerical, graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object.
• Describe a ratio relationship between kinetic energy and mass separately from kinetic energy and speed.
• Understand the concept of a unit rate a/b associated with a ratio a:b with b≠, and use rate language in the context of a ratio relationship between kinetic energy and mass separately from kinetic energy and speed.
• Recognize and represent proportional relationships between kinetic energy and mass separately from kinetic energy and speed.
• Know and apply the properties of integer exponents to generate equivalent numerical expressions when describing the relationships between kinetic energy and mass separately from kinetic energy and speed.
• When constructing and interpreting graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object, use square root and cube root symbols to represent

solutions to equations of the form x2=p and x3=p, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that √2 is irrational.
• When constructing and interpreting graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object, interpret the equation y = mx + b as defining a linear function whose graph is a straight line; give examples of functions that are not linear.
• Reason abstractly and quantitatively when analyzing data to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.
• Understand the concept of ratio and use ratio language to describe the ratio relationships between the change in the kinetic energy of an object and the energy transferred to or from the object.
• Recognize and represent proportional relationships between the change in the kinetic energy of an object and the energy transferred to or from the object.
• Interpret the equation y = mx + b as defining a linear function whose graph is a straight line; give examples of functions that are not linear when describing the change in the kinetic energy of an object and the energy transferred to or from the object.
• Reason abstractly and quantitatively. (MS-PS3-1),(MS-PS3-5) MP.2
• Understand the concept of ratio and use ratio language to describe a ratio relationship between two quantities. (MS-PS3-1),(MS-PS3-5) 6.RP.A.1
• Understand the concept of a unit rate a/b associated with a ratio a:b with b ≠ 0, and use rate language in the context of a ratio relationship. (MS-PS3-1) 6.RP.A.2
• Recognize and represent proportional relationships between quantities. (MS-PS3-1),(MS-PS3-5) 7.RP.A.2
• Know and apply the properties of integer exponents to generate equivalent numerical expressions. (MS-PS3-1) 8.EE.A.1
• Use square root and cube root symbols to represent solutions to equations of the form x2 = p and x3 = p, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that √2 is irrational. (MS-PS3-1) 8.EE.A.2
• Interpret the equation y = mx + b as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. (MS-PS3-1),(MS-PS3-5) 8.F.A.3

Unit 4: 802 Energy & Matter Flow in Organisms & Ecosystems

Content Area: **Sample Content Area**
Course(s):
Time Period: **3rd Marking Period**
Length: **Sample Length**
Status: **Not Published**

Summary of the Unit

Students analyze and interpret data, develop models, construct arguments, and demonstrate a deeper understanding of the cycling of matter, the flow of energy, and resources in ecosystems. They are able to study patterns of interactions among organisms within an ecosystem. They consider biotic and abiotic factors in an ecosystem and the effects these factors have on populations. They also understand that the limits of resources influence the growth of organisms and populations, which may result in competition for those limited resources. The crosscutting concepts of matter and energy, systems and system models, patterns, and cause and effect provide a framework for understanding the disciplinary core ideas. Students demonstrate grade-appropriate proficiency in analyzing and interpret data, developing models, and constructing arguments. Students are also expected to use these practices to demonstrate understanding of the core ideas.
This unit is based on MS-LS2-1, MS-LS2-2, and MS-LS2-3.

Enduring Understandings

Physical science

• Chemical processes, their rates, and whether or not energy is stored or released can be understood in terms of the collisions of molecules and the rearrangements of atoms into new molecules, with consequent changes in the sum of all bond energies in the set of molecules that are matched by changes in kinetic energy.

• In many situations, a dynamic and condition-dependent balance between a reaction and the reverse reaction determines the numbers of all types of molecules present.

• The fact that atoms are conserved, together with knowledge of the chemical properties of the elements involved, can be used to describe and predict chemical reactions.

Life science

• The process of photosynthesis converts light energy into stored chemical energy by converting carbon dioxide plus water into sugars plus released oxygen.

• The sugar molecules thus formed contain carbon, hydrogen, and oxygen; their hydrocarbon backbones are used to make amino acids and other carbon-based molecules that can be assembled into larger molecules (such as proteins or DNA), used, for example, to form new cells.

• As matter and energy flow through different organizational levels of living systems, chemical elements are

recombined in different ways to form different products.

• As a result of these chemical reactions, energy is transferred from one system of interacting molecules to another.

• Cellular respiration is a chemical process in which the bonds of food molecules and oxygen molecules are broken and new compounds that can transport energy to muscles are formed. Cellular respiration releases the energy needed to maintain body temperature despite ongoing energy transfer to the surrounding environment.

• Photosynthesis and cellular respiration (including anaerobic processes) provide most of the energy for life processes.

• Plants or algae form the lowest level of the food web.

• At each link upward in a food web, only a small fraction of the matter consumed at the lower level is transferred upward to produce growth and release energy in cellular respiration at the higher level. Given this inefficiency, there are generally fewer organisms at higher levels of a food web.

• Biodiversity is a result of a constantly changing environment.
• Carbon cycles through Earth systems and is impacted by human activities.

• Matter and Energy move within and between biotic and abiotic components of ecosystems via physical, chemical and biological processes.
• Growth and division of cells in organisms occur by mitosis and differentiation for specific cell types.

• Some matter reacts to release energy for life functions, some matter is stored in newly made structures, and much is discarded.

• The chemical elements that make up the molecules of organisms pass through food webs and into and out of the atmosphere and soil, and they are combined and recombined in different ways.

• At each link in an ecosystem, matter and energy are conserved.

• Photosynthesis and cellular respiration are important components of the carbon cycle, in which carbon is exchanged among the biosphere, atmosphere, oceans, and geosphere through chemical, physical, geological, and biological processes.

Earth and space science

• 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.

• Gradual atmospheric changes were due to plants and other organisms that captured carbon dioxide and released oxygen.

• Changes in the atmosphere due to human activity have increased carbon dioxide concentrations and thus affect climate.

Essential Questions

1. How do changes in the availability of matter and energy effect populations in an ecosystem?

2. What do plants need to survive?

3. How do some organisms turn electromagnetic radiation into matter and energy?

4. Where does most of the biomass of trees come from?

5. How do relationships among organisms, in an ecosystem, effect populations?

6. How are matter and energy cycled throughout an ecosystem?

7. How can you explain the stability of an ecosystem by tracing the flow of matter and energy?

8. How do we determine the effects of biotic and abiotic factors on an ecosystem?

9. How can you create a new community in an area with only abiotic factors through ecological succession?

Summative Assessment and/or Summative Criteria

• Quarterly assessments per marking period, end of unit assessments (tests, quizzes, labs, activities).

Resources

Textbooks/workbooks

Mosa Mack

Discovery Ed

Achieve 3000

Lab materials (varies)

Brain Pop

Chromebooks/Ipads

See Instructional Activities/websites under Units for Curriculum.

Unit Plan

Topic Selection Timeframe	Content	General Objectives	Instructional Activities
Energy Flow in Organisms 14 Days	Cell Structure Producers Consumers Decomposers Photosynthesis Cellular Respiration Biomass	Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy. Explain the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms. Plan and carry out an investigation to determine the form of energy released during cellular respiration. Identify the importance of decomposers in the cycling of matter and energy in an	Microscope Activity: View Onion Cell to see cell structure in distilled water wet mount View Onion Cell to determine water's role in cell with wet mount in dist Discovery Education Units https://app.discoveryeducation.com/learn/collections/18B0CD74-FB69 DE-9997-B4309A1EE58F?utm_campaign=Curated_Collections&utm_m m=Search_Banner&utm_source=DiscoveryEducation&homework_id= Seasons of the Cell, Photosynthesis Discovery Ed https://app.discoveryeducation.com/search?Ntt=photosynthesis#selIt = 0%252B4294938914%252B4294938926%252B4294938799&Ne=&Ntt =&Nr=&browseFilter=&Ntk=&indexVersion Mosa Mack Unit: Photosynthesis

		ecosystem.	
Ecosystem Creation and Matter Cycles 14 Days	Biotic & Abiotic Factors Primary Succession Pioneer Organisms Examples of Cycles of Matter (Nitrogen cycle, Carbon cycle)	Recognize what biodiversity refers to and why it is important. Explain how events and processes that occur during ecological succession can change populations and species diversity. Support the claim that most of the biomass in an ecosystem came from carbon dioxide gas in the atmosphere.	Succession Interactive: https://biomanbio.com/HTML5GamesandLabs/EcoGames/succession_interactive.html Map out the Nitrogen Cycle in an ecosystem Plan and carry out an investigation on the biodiversity in a random square yard outside th In a Google slide presentation, illustrate the stages of primary succession of a Hawaiian l
Relationships Between Organisms 10 Days	Trophic Pyramids Food Chains Food Webs	Investigate energy flow in ecosystems. Recognize how energy from the sun is introduced into an ecosystem through producers. Calculate and predict diminishing available of energy on different levels of a trophic pyramid.	Food Chain Gizmo: Manipulate amounts of animals at different points in the food chain to see what happens: https://www.explorelearning.com/index.cfm?method=cResource.dspDetail&ResourceID= Hands on Yarn food chain activity http://www.bigelow.org/foodweb/chain1.html Mosa Mack Unit: Food Webs

Suggested Modifications for Special Education, ELL and Gifted Students

*Consistent with individual plans, when appropriate.
Restructure lesson using UDL principals (http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA); Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.; Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).; Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).; Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).; Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.; Use project-based science learning to connect science with observable phenomena.; Structure the learning around explaining or solving a social or community-based issue.; Provide ELL students with multiple literacy strategies. ; Collaborate with after-school programs or clubs to extend learning opportunities. English Language Learners - Websites with various language options.

Suggested Technological Innovations/Use

Use of Chromebooks, Google Classroom, Web-quests, Google Forms, LinkIt, Achieve 3000

Cross Curricular/21st Century Connections

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English Language Arts/Literacy
•Cite specific, empirical, textual evidence to support analysis of how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants, respectively.
•Trace and evaluate the argument and specific claims in a text about how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants, respectively. Distinguish claims that are supported by empirical evidence and scientific reasoning from claims that are not.
•Write an argument focused on how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants, respectively.
Mathematics
• Reason abstractly and quantitatively by interpreting numerical, graphical displays of data to describe the

relationships of kinetic energy to the mass of an object and to the speed of an object.

• Describe a ratio relationship between kinetic energy and mass separately from kinetic energy and speed.

• Understand the concept of a unit rate a/b associated with a ratio a:b with b≠, and use rate language in the context of a ratio relationship between kinetic energy and mass separately from kinetic energy and speed.

• Recognize and represent proportional relationships between kinetic energy and mass separately from kinetic energy and speed. • Know and apply the properties of integer exponents to generate equivalent numerical expressions when describing the relationships between kinetic energy and mass separately from kinetic energy and speed.

• When constructing and interpreting graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object, use square root and cube root symbols to represent solutions to equations of the form x2=p and x3=p, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that √2 is irrational.

• When constructing and interpreting graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object, interpret the equation y = mx + b as defining a linear function whose graph is a straight line; give examples of functions that are not linear.

• Reason abstractly and quantitatively when analyzing data to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.

• Understand the concept of ratio and use ratio language to describe the ratio relationships between the change in the kinetic energy of an object and the energy transferred to or from the object.

• Recognize and represent proportional relationships between the change in the kinetic energy of an object and the energy transferred to or from the object.

• Interpret the equation y = mx + b as defining a linear function whose graph is a straight line; give examples of functions that are not linear when describing the change in the kinetic energy of an object and the energy transferred to or from the object.

• Reason abstractly and quantitatively. (MS-PS3-1),(MS-PS3-5) MP.2

• Understand the concept of ratio and use ratio language to describe a ratio relationship between two quantities. (MS-PS3-1),(MS-PS3-5) 6.RP.A.1

• Understand the concept of a unit rate a/b associated with a ratio a:b with b ≠ 0, and use rate language in the context of a ratio relationship. (MS-PS3-1) 6.RP.A.2

• Recognize and represent proportional relationships between quantities. (MS-PS3-1),(MS-PS3-5) 7.RP.A.2

• Know and apply the properties of integer exponents to generate equivalent numerical expressions. (MS-PS3-1) 8.EE.A.1

• Use square root and cube root symbols to represent solutions to equations of the form x2 = p and x3 = p, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that √2 is irrational. (MS-PS3-1) 8.EE.A.2

• Interpret the equation y = mx + b as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. (MS-PS3-1),(MS-PS3-5) 8.F.A.3

Unit 5: 802 Cell Division, Genetic Variation, & Natural Selection

Content Area: **Sample Content Area**
Course(s):
Time Period: **4th Marking Period**
Length: **Sample Length**
Status: **Not Published**

Summary of the Unit

Students develop and use models to describe how gene mutations and sexual reproduction contribute to genetic variation. Students understand how genetic factors determine the growth of an individual organism. They also demonstrate understanding of the genetic implications of sexual and asexual reproduction. Students use data and conceptual models to understand how the environment and genetic factors determine the growth of an individual organism. They connect this idea to the role of animal behaviors in animal reproduction and to the dependence of some plants on animal behaviors for their reproduction. Students provide evidence to support their understanding of the structures and behaviors that increase the likelihood of successful reproduction by organisms. The crosscutting concepts of cause and effect and structure and function provide a framework for understanding the disciplinary core ideas. Students demonstrate grade-appropriate proficiency in analyzing and interpreting data, using models, conducting investigations, and communicating information. Students are also expected to use these practices to demonstrate understanding of the core ideas.
This unit is based on MS-LS1-4 and MS-LS1-5.

Enduring Understandings

• Systems of specialized cells within organisms help perform essential functions of life.
• In multicellular organisms, individual cells grow and then divide via a process called mitosis.

• The instructions for forming species' characteristics are carried in DNA.

• Chromosomes can swap sections during cell division creating new genetic combinations and thus more genetic variation.

Essential Questions

1. How do characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants, respectively?

2. How do offspring get traits from their parents?

3. Why do some people look more liked their dad and some look more like their mom?

4. What is a Punnett Square and how does it help us predict the traits of offspring?

5. Why do some children show traits that neither of their parents display?

6. How do environmental and genetic factors influence the growth of organisms?

Summative Assessment and/or Summative Criteria

• Quarterly assessments per marking period, end of unit assessments (tests, quizzes, labs, activities).

Resources

Textbooks/workbooks

Lab materials (varies)

Chromebooks/Ipads

See Instructional Activities below for websites.

Unit Plan

Topic Timeframe	Content	General Objectives	Instructional Activities
Cell division 7 Days	Cell Theory	Identify the needs for mitosis.	Mitosis Mover: https://biomanbio.com/HTML5GamesandLabs/Genegames/mitosismoverpage.html

	Cell Cycle Mitosis Apoptosis	Develop and use a model to describe why structural changes to genes located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism.	Animal Cell Mitosis: https://www.cellsalive.com/mitosis_js.htm Plant Cell Mitosis: https://www.edumedia-sciences.com/en/media/423-plant-cell-mitosis Cell Theory: https://www.filamentlearning.com/cell-command-lesson-1-cell-theory Mosa Mack Unit: Cells
Inheritance of traits 11 Days	Types of Asexual reproduction Meiosis Punnett Squares Alleles Dominant & Recessive traits Homozygous & Heterozygous	Consider the advantages and disadvantages of sexual vs. asexual reproduction. Demonstrate how genes, through homozygous or heterozygous pairing, interact to express dominant or recessive traits Use a Punnett square model to determine the possible traits of offspring and given offspring and to determine parents.	Observe a multicellular animal that undergoes asexual reproduction Prepare a Planarian Worm for later observation of regeneration Observe the process of vegetative propagation by planting cut segments from a cactus or other plant. http://sciencelearn.org.nz/Contexts/Uniquely -Me/Science-Ideas-and-Concepts/Genotype-and-phenotype Mosa Mack Unit: Genetic Variation
Variations of traits 6 Days Biological	Mutations Genetic Variation	Describe the process of how a gene is transformed into a trait, and understand the role of mutations in evolution and genetic diversity. Observe scenarios illustration the advantages of genetic variation.	The purpose of these activities is to provide models for natural selection, adaptation and variation among species in order to identify how environment and genetics will affect the growth and reproduction among a species. http://www.vtaide.com/png/bird-adaptations3.htm http://www.ucmp.berkeley.edu./education/lessons/candy_dish.html

Evolution 6 Days	Natural Selection	Interpret data graphs and models to identify how both environmental and genetic factors influence the growth of organisms. Gain an understanding of the phases of meiosis and how it promotes genetic diversity.	Discovery Education Reading Passages: Against All Odds http://tinyurl.com/gq3eldm True Blue http://tinyurl.com/zfahzpc -Discovery Education Interactive Heredity http://tinyurl.com/hlyspmy -Discovery Education Video Clips Geneticist http://tinyurl.com/gp9jbv4 Genetics http://tinyurl.com/h7yav7a Mosa Mack Unit: Mutations

Suggested Modifications for Special Education, ELL and Gifted Students

*Consistent with individual plans, when appropriate.

• Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.

• Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).

• Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).

• Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).

• Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.

• Use project-based science learning to connect science with observable phenomena.

• Structure the learning around explaining or solving a social or community-based issue.

• Provide ELL students with multiple literacy strategies.

• Collaborate with after-school programs or clubs to extend learning opportunities. Restructure lesson using UDL principals (http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA)

Suggested Technological Innovations/Use

Use of Chromebooks, Google Classroom, Web-quests, Google Forms, LinkIt, Achieve 3000

Cross Curricular/21st Century Connections

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English Language Arts/Literacy
• Cite specific, empirical, textual evidence to support analysis of how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants, respectively.
• Trace and evaluate the argument and specific claims in a text about how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants, respectively. Distinguish claims that are supported by empirical evidence and scientific reasoning from claims that are not.
• Write an argument focused on how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants, respectively.
• Cite specific textual evidence to support analysis of science and technical texts. (MS-LS1-4),(MS-LS1-5) RST.6-8.1
• Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. (MS-LS1-5) RST.6-8.2
• Trace and evaluate the argument and specific claims in a text, distinguishing claims that are supported by reasons and evidence from claims that are not. (MS-LS1-4) RI.6.8
• Write arguments focused on discipline content. (MS-LS1-4) WHST.6-8.1
• Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. (MS-LS1-5) WHST.6-8.2
• Draw evidence from informational texts to support analysis, reflection, and research. (MS-LS1-5) WHST.6-8.9
Mathematics
• Understand that a set of data collected to answer a statistical question about how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants, respectively, has a distribution which can be described by its center (mean), spread (range), and overall shape (shape of the distribution of data).
• Summarize numerical data sets, collected to answer a statistical question about how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants, respectively, that have a distribution that can be described by its center (mean), spread (range), and overall shape (shape of the distribution of data) in relation to their context.

• Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape. (MS-LS1-4),(MS-LS1-5) 6.SP.A.2
• Summarize numerical data sets in relation to their context. (MS-LS1-4),(MS-LS1-5) 6.SP.B.4

Unit 6: 802 Growth, Development and Reproduction in Organisms

Content Area: **Science**
Course(s):
Time Period: **4th Marking Period**
Length: **1**
Status: **Not Published**

Summary of Unit

Students use data and conceptual models to understand how the environment and genetic factors determine the growth of an individual organism. They connect this idea to the role of animal behaviors in animal reproduction and to the dependence of some plants on animal behaviors for their reproduction. Students provide evidence to support their understanding of the structures and behaviors that increase the likelihood of successful reproduction by organisms. The crosscutting concepts of cause and effect and structure and function provide a framework for understanding the disciplinary core ideas. Students demonstrate gradeappropriate proficiency in analyzing and interpreting data, using models, conducting investigations, and communicating information. Students are also expected to use these practices to demonstrate understanding of the core ideas.

Enduring Understandings

- Systems of specialized cells within organisms help perform essential functions of life.
- Animals engage in characteristic behaviors that increase the odds of reproduction.
- Feedback mechanisms maintain an organism's internal condition within certain limits and mediate behaviors.
- Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction.

Essential Questions

1. How do characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants, respectively?

2. How do environmental and genetic factors influence the growth of organisms?

3. How do behaviors and structures allow plants and animals to better survive?

4. Are animal courtship behaviors and plant structures influenced by natural selection?

Summative Assessment/Summative Criteria

• Quarterly assessments per marking period, end of unit assessments (tests, quizzes, labs, activities).

Resources

Textbooks/workbooks

Lab materials (varies)

Chromebooks/Ipads

See Instructional Activities below for websites.

Unit Plan

Topic Timeframe	Content	General Objectives	Instru
Animal Reproduction 7 Days	Animal Courtship behavior	Describe courtship behaviors in relationship to natural selection.	
	External fertilization Internal fertilization Oviparous Viviparous	Consider the advantages and disadvantages of internal and external fertilization. Identify the advantages and disadvantages of oviparous and viviparous birth. Identify evidence that supports how the characteristics of animal behavior and specialized plant structures allow for successful reproduction in organisms	Observe examples of animal behav etc.) that could affect the probabilit behaviors could include nest buildi animals to protect young from pred to attract mates for breeding. Conduct a debate as to the pros and Mosa Mack Unit: Plant and Anima
Plant Reproduction 7 days	Flower structures	Investigate the structure and function of flowers and conclude that plants rely on the wind and/or different types of pollinators to	This activity will provide evidence dependent on plants to provide food reproduction is crucial to all other l

Plant sex cells	help them successfully reproduce	Activity 1: Identify the plant parts i (bee) structures involved in pollina stamen to the female stigma. Activity 2: Interpret links between
Pollinators Wind pollination Seed dispersal techniques	Explore seed structures and dispersal methods to understand how these structures allow for a better chance of survival for their newly created offspring	Mosa Mack Unit: Plant and Anima

Suggested Modifications for Special Education, ELL, and Gifted Students

• Consistent with individual plans, when appropriate.

• Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.

• Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).

• Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).

• Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).

• Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.

• Use project-based science learning to connect science with observable phenomena.

• Structure the learning around explaining or solving a social or community-based issue. • Provide ELL students with multiple literacy strategies.

• Collaborate with after-school programs or clubs to extend learning opportunities.

Suggested Technological Innovations/Use

• Chromebooks/IPads

• Google Classroom

• Web-quests

• Discovery Education

• BrainPop/ Kahoot/Science and STEM related computer program

• Online Textbook

• TED Talks

Cross Curricular/21st Century Connections

9.1 21st Century Life and Career Skills: All students will demonstrate the creative, critical thinking, collaboration, and problem-solving skills needed to function successfully as both global citizens and workers in diverse ethnic and organizational cultures. 9.2 21st Century Life and Career Skills: Personal Financial Literacy: All students will develop skills and strategies that promote personal and financial responsibility related to financial planning, savings, investment, and charitable giving in the global economy. 9.3 21st Century Life and Career Skills: Career Awareness, Exploration, and Preparation: All students will apply knowledge about and engage in the process of career awareness, exploration, and preparation in order to navigate the globally competitive work environment of the information age.

English Language Arts/Literacy

• Cite specific, empirical, textual evidence to support analysis of how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants, respectively.

• Trace and evaluate the argument and specific claims in a text about how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants, respectively. Distinguish claims that are supported by empirical evidence and scientific reasoning from claims that are not.

• Write an argument focused on how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants, respectively.

• Cite specific textual evidence to support analysis of science and technical texts. (MS-LS1-4),(MS-LS1-5) RST.6-8.1

• Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from

prior knowledge or opinions. (MS-LS1-5) RST.6-8.2

• Trace and evaluate the argument and specific claims in a text, distinguishing claims that are supported by reasons and evidence from claims that are not. (MS-LS1-4) RI.6.8

• Write arguments focused on discipline content. (MS-LS1-4) WHST.6-8.1

• Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. (MS-LS1-5) WHST.6-8.2

• Draw evidence from informational texts to support analysis, reflection, and research. (MS-LS1-5) WHST.6-8.9

Mathematics

• Understand that a set of data collected to answer a statistical question about how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants, respectively, has a distribution which can be described by its center (mean), spread (range), and overall shape (shape of the distribution of data).

• Summarize numerical data sets, collected to answer a statistical question about how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants, respectively, that have a distribution that can be described by its center (mean), spread (range), and overall shape (shape of the distribution of data) in relation to their context.

• Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape. (MS-LS1-4),(MS-LS1-5) 6.SP.A.2

• Summarize numerical data sets in relation to their context. (MS-LS1-4),(MS-LS1-5) 6.SP.B.4

Unit 7: 802 Interdependent Relationships in Ecosystems

Content Area: **Sample Content Area**
Course(s):
Time Period: **4th Marking Period**
Length: **Sample Length**
Status: **Not Published**

Summary of the Unit

Students build on their understandings of the transfer of matter and energy as they study patterns of interactions among organisms within an ecosystem. They consider biotic and abiotic factors in an ecosystem and the effects these factors have on a population. They construct explanations for the interactions in ecosystems and the scientific, economic, political, and social justifications used in making decisions about maintaining biod iversity in ecosystems. The crosscutting concept of stability and change provide a framework for understanding the disciplinary core ideas. This unit includes a two-stage engineering design process. Students first evaluate different engineering ideas that have been proposed using a systematic method, such as a tradeoff matrix, to determine which solutions are most promising. They then test different solutions, and combine the best ideas into a new solution that may be better than any of the preliminary ideas. Students demonstrate grade appropriate proficiency in asking questions, designing solutions, engaging in argument from evidence, developing and using models, and designing solutions. Students are also expected to use these practices to demonstrate understanding of the core ideas. This unit is based on MS-LS2-4, MS-LS2-5, MS-ETS1-1, and MS-ETS1-3.

Enduring Understandings

• If a biological or physical disturbance to an ecosystem occurs, including one induced by human activity, the ecosystem may return to its more or less original state or become a very different ecosystem, depending on the complex set of interactions within the ecosystem.

• Biodiversity is increased by the formation of new species and reduced by extinction. Humans depend on biodiversity but also have adverse impacts on it. Sustaining biodiversity is essential to supporting life on earth.

Essential Questions

1. How can a single change to an ecosystem disrupt the whole system?

2. What limits the number and variety of living things in an ecosystem?

Summative Assessment and/or Summative Criteria

Quarterly assessments per marking period, end of unit assessments (tests, quizzes, labs, activities).

Resources

Textbooks/workbooks

Mosa Mack

Discovery Ed

Achieve 3000

Lab materials (varies)

Brain Pop

Chromebooks/Ipads

See Instructional Activities/websites under Units for Curriculum.

Unit Plan

Topic/Selection Timeframe	Content	General Objectives	Instructional Activities	Bench Asses
Collect empirical evidence that will be used to argue that physical or biological components of an ecosystem affect populations.	Abiotic factors Biotic factors	Evaluate existing solutions for maintaining biodiversity and ecosystem services to determine which solutions are most promising. Develop a probability and use it to determine the	Students should recognize patterns in data about changes to components in ecosystems and make inferences about how these changes contribute to changes in the biodiversity of populations. Students should investigate and design investigations to test their ideas and develop possible solutions to problems caused when changes in the biodiversity of an ecosystem affect resources (food, energy, and medicine) as well as ecosystem services (water purification, nutrient recycling, soil erosion prevention) available to humans.	-Quarter Assessm -Portfolio Assessm -Section -Chapter -Concept

6 Days	Biodiversity	probability that designed systems, including those representing inputs and outputs, will maintain biodiversity and ecosystem services	Students can then construct arguments using evidence to support recognized patterns of change in factors such as global temperatures and their effect on populations and the environment. As part of their argument, students need to note how small changes in one part of an ecosystem might cause large changes in another part. While collecting evidence for their arguments about maintaining biodiversity, students will trace and evaluate specific claims in a text, distinguishing claims that are supported by reasons and evidence from claims that are not. Students will evaluate the argument and claims in text, assess whether the reasoning is sound and the evidence is relevant and sufficient to support the claims. Use Farmer's Almanac to fill in graph with climate change data.	Practical hands or problems example -Google Presenta -Lab Rep -Worksh
Use evidence collected and understanding of how changes in the biodiversity of populations can impact ecosystem services. 5 Days	Trophic pyramids	Use evidence collected and understanding to evaluate competing design solutions.	Research and develop a Google Slides presentation to convince your town not to use bee killing pesticides and support your argument with data that shows why bees are important to all ecosystems. http://www.cnn.com/2016/09/01/health/zika-spraying-honeybees/ Mosa Mack Unit: Biodiversity	Quarterl Assessm -Portfoli Assessm -Section -Chapter -Concep Practical using ha problems example -GoogleS Presenta -Lab Rep -Worksh -Mosa M

Suggested Modifications for Special Education, ELL and Gifted Students

• Consistent with individual plans, when appropriate.

• Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.

• Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).

• Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).

• Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).

• Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.

• Use project-based science learning to connect science with observable phenomena.

• Structure the learning around explaining or solving a social or community-based issue.

• Provide ELL students with multiple literacy strategies.

• Collaborate with after-school programs or clubs to extend learning opportunities.

• Restructure lesson using UDL principals (http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA)

Suggested Technological Innovations/Use

• Chromebooks/IPads

• Google Classroom

• Web-quests

• Discovery Education

• BrainPop/ Kahoot/Science and STEM related computer program

• Online Textbook

• Google forms

LinkIt

Achieve 3000

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English Language Arts/Literacy

• Distinguish among facts, reasoned judgment based on research findings, and speculation when reading text about maintaining biodiversity and ecosystem services. Examples of ecosystem services could include water purification, nutrient recycling, and prevention of soil erosion.

• Trace and evaluate the argument and specific claims in a text about maintaining biodiversity and ecosystem services, distinguishing claims that are supported by reasons and evidence from claims that are not. Trace and evaluate the arguments about specific claims in a text and assess whether the reasoning is sound and the evidence is relevant and sufficient to support the claims.

• Include multimedia components and visual displays as part of an argument about competing design solutions based on jointly developed and agreed-upon design criteria to clarify information. Include multimedia components and visual displays. The multimedia component and visual displays should clarify claims and findings and emphasize salient points in the presentation.

Mathematics

• Model design solutions for maintaining biodiversity and ecosystem services with mathematics. Use ratio and rate reasoning to evaluate competing design solutions for maintaining biodiversity and ecosystem services.

• Develop a model that generates data for the iterative testing of competing design solutions involving a proposed object, tool, or process that maintains biodiversity and ecosystem services, reasoning quantitatively (with amounts, numbers, sizes) and abstractly (with variables).

• Develop a probability and use it to find the probability that designed systems, including those representing inputs and outputs, will maintain biodiversity and ecosystem services. Compare probabilities from the model to observe frequencies. If the agreement is not good, explain possible sources of the discrepancy.