

**SCIENCE MS COLLEGE and CAREER READINESS STANDARDS  
MADISON COUNTY SCHOOL DISTRICT  
6<sup>TH</sup> GRADE PACING GUIDE**

Note to educators: This document does not replace the standards. The pacing guide is not a stand-alone document and must be used in conjunction with the standards. The pacing guide provides clarification and helps teachers to better plan their time by showing what topics are to be taught during a nine-week period. The pacing guide does not provide the conceptual “big picture” required to fully comprehend the goal of the standard.

**SCIENCE MS COLLEGE and CAREER READINESS STANDARDS  
MADISON COUNTY SCHOOL DISTRICT  
6<sup>TH</sup> GRADE: 1<sup>ST</sup> NINE WEEKS**

**INQUIRY**

*Clarification: Inquiry skills must be taught first nine weeks but reinforced each nine weeks through activities, labs, and experiments.*

Additional Information:

- lab safety
- lab equipment
- graphing
- scientific method

**LIVING THINGS**

**L.6.1.1 Use argument supported by evidence in order to distinguish between living and non-living things, including viruses and bacteria.**

*Clarification: After teaching the characteristics and needs of living things, have students debate whether given examples are living or non-living and provide proof.*

**L.6.1.2 Obtain and communicate evidence to support the cell theory.**

Additional Information:

- Include Francesco Redi's experiment to disprove spontaneous generation.

**L.6.4.1 Compare and contrast modern classification techniques (e.g., analyzing genetic material) to the historical practices used by scientists such as Aristotle and Carolus Linnaeus.**

Additional Information:

- Emphasize how technology has led to more groups and moved organisms from group to group.

**BACTERIA**

**L.6.4.2 Use classification methods to explore the diversity of organisms in kingdoms (animals, plants, fungi, protists, bacteria). Support claims that organisms have shared structural and behavioral characteristics.**

*Clarification: Only teach the Archaeobacteria kingdom and Eubacteria kingdom at this time. Compare and contrast organisms of Eubacteria kingdom: spirilla, bacilli, and cocci. Compare and contrast organisms of Archaeobacteria kingdom: methanogens, halophiles, and thermophiles.*

Additional Information:

- Structural characteristics –ex. type (prokaryotic) and organization (unicellular) of cell
- Behavioral characteristics – ex. reproduction (asexual) and energy acquisition (autotrophs or heterotrophs)

**L.6.1.5 Provide evidence that organisms are unicellular or multicellular.**

**L.6.1.3 Develop and use models to explain how specific cellular components (cell wall, cell membrane, nucleus, chloroplast, vacuole, and mitochondria) function together to support the life of prokaryotic and eukaryotic organisms to include plants, animals, fungi, protists, and bacteria (not to include biochemical function of cells or cell part).**

*Clarification: Only teach bacteria cell parts and functions at this time.*

**L.6.4.5 Engage in scientific arguments to support claims that bacteria (Archaeobacterial and Eubacteria) and viruses can be both helpful and harmful to other organisms and the environment.**

*Clarification: Debate (as in Socratic seminar or a court case) ways bacteria and viruses can be beneficial as well as detrimental.*

## **ANIMALS**

**L.6.4.2 Use classification methods to explore the diversity of organisms in kingdoms (animals, plants, fungi, protists, bacteria). Support claims that organisms have shared structural and behavioral characteristics.**

*Clarification: Only teach the Animalia kingdom at this time. Compare and contrast organisms of Animal kingdom: vertebrates and invertebrates.*

Additional Information:

- Structural characteristics –ex. type (eukaryotic) and organization (multicellular) of cell
- Behavioral characteristics – ex. reproduction (mostly sexual) and energy acquisition (heterotrophs)

**L.6.1.5 Provide evidence that organisms are unicellular or multicellular.**

**L.6.1.3 Develop and use models to explain how specific cellular components (cell wall, cell membrane, nucleus, chloroplast, vacuole, and mitochondria) function together to support the life of prokaryotic and eukaryotic organisms to include plants, animals, fungi, protists, and bacteria (not to include biochemical function of cells or cell part).**

*Clarification: Only teach animal cell parts and functions at this time.*

**L.6.1.4 Compare and contrast different cells in order to classify them as a protist, fungus, plant, or animal.**

*Clarification: Discuss similarities and differences between an animal cell and a bacterial cell.*

**L.6.1.6 Develop and use models to show relationships among the increasing complexity of multicellular organisms (cells, tissues, organs, organ systems, organisms) and how they serve the needs of the organism.**

*Clarification: Choose and discuss specific human tissues, organs, and systems to show how they work together.*

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**PLANTS**

**L.6.4.2 Use classification methods to explore the diversity of organisms in kingdoms (animals, plants, fungi, protists, bacteria). Support claims that organisms have shared structural and behavioral characteristics.**

*Clarification: Only teach Plantae kingdom at this time. Compare and contrast organisms of Plant kingdom: vascular and nonvascular.*

Additional Information:

- Structural characteristics –ex. type (prokaryotic) and organization (multicellular) of cell
- Behavioral characteristics – ex. reproduction (mostly sexual) and energy acquisition (autotrophs)

**L.6.1.5 Provide evidence that organisms are unicellular or multicellular.**

**L.6.1.3 Develop and use models to explain how specific cellular components (cell wall, cell membrane, nucleus, chloroplast, vacuole, and mitochondria) function together to support the life of prokaryotic and eukaryotic organisms to include plants, animals, fungi, protists, and bacteria (not to include biochemical function of cells or cell part).**

*Clarification: Only teach plant cell parts and functions at this time.*

**L.6.1.4 Compare and contrast different cells in order to classify them as a protist, fungus, plant, or animal.**

*Clarification: Discuss similarities and differences between bacterial, plant, and animal cells.*

**L.6.1.6 Develop and use models to show relationships among the increasing complexity of multicellular organisms (cells, tissues, organs, organ systems, organisms) and how they serve the needs of the organism.**

*Clarification: Discuss specific plant tissues, organs, and systems to show how they work together.*

## **FUNGI**

**L.6.4.2 Use classification methods to explore the diversity of organisms in kingdoms (animals, plants, fungi, protists, bacteria). Support claims that organisms have shared structural and behavioral characteristics.**

*Clarification: Only teach Fungi kingdom at this time. Compare and contrast organisms of Fungus kingdom: club, sac, conjugating, and imperfect.*

Additional Information:

- Structural characteristics –ex. type (prokaryotic) and organization (unicellular or multicellular) of cell
- Behavioral characteristics – ex. reproduction (sexual or asexual) and energy acquisition (heterotrophs- specifically saprotrophs)

**L.6.4.3 Analyze and interpret data from observations to describe how fungi obtain energy and respond to stimuli (e.g., bread mold, rotting plant material).**

*Clarification: Perform an experiment to show how fungi only grows on organic material. Also, perform experiments to test reactions to stimuli such as light, temperature, water, and gravity.*

**L.6.1.5 Provide evidence that organisms are unicellular or multicellular.**

**L.6.1.3 Develop and use models to explain how specific cellular components (cell wall, cell membrane, nucleus, chloroplast, vacuole, and mitochondria) function together to support the life of prokaryotic and eukaryotic organisms to include plants, animals, fungi, protists, and bacteria (not to include biochemical function of cells or cell part).**

*Clarification: Only teach fungal cell parts and functions at this time.*

**L.6.1.4 Compare and contrast different cells in order to classify them as a protist, fungus, plant, or animal.**

*Clarification: Discuss similarities and differences of bacterial, animal, plant, and fungal cells.*

## **PROTISTS**

**L.6.4.2 Use classification methods to explore the diversity of organisms in kingdoms (animals, plants, fungi, protists, bacteria). Support claims that organisms have shared structural and behavioral characteristics.**

*Clarification: Only teach Protista kingdom at this time. Compare and contrast organisms of Protist kingdom: animal-like, plant-like, and fungus-like.*

Additional Information:

- Structural characteristics –ex. type (prokaryotic) and organization (unicellular or multicellular) of cell
- Behavioral characteristics – ex. reproduction (asexual or sexual) and energy acquisition (autotrophs or heterotrophs)

**L.6.1.5 Provide evidence that organisms are unicellular or multicellular.**

**L.6.1.3 Develop and use models to explain how specific cellular components (cell wall, cell membrane, nucleus, chloroplast, vacuole, and mitochondria) function together to support the life of prokaryotic and eukaryotic organisms to include plants, animals, fungi, protists, and bacteria (not to include biochemical function of cells or cell part).**

*Clarification: Only teach protist cell parts and functions at this time.*

**L.6.1.4 Compare and contrast different cells in order to classify them as a protist, fungus, plant, or animal.**

**L.6.4.4 Conduct investigations using a microscope or multimedia source to compare the characteristics of protists (euglena, paramecium, amoeba) and the methods they use to obtain energy and move through their environment (e.g., pond water).**

Additional Information:

- This is an opportunity to allow students to use microscopes to view the movements of different microorganisms in pond water.
- Multimedia sources may be best to view energy acquisition for these microorganisms.

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**ECOLOGY**

**L.6.3.1 Use scientific reasoning to explain differences between biotic and abiotic factors that demonstrate what living organisms need to survive.**

**L.6.3.2 Develop and use models to describe the levels of organization within ecosystems (species, populations, communities, ecosystems, and biomes).**

Additional Information:

- Review biomes as these were taught in 5<sup>th</sup> grade.

**L.6.3.3 Analyze cause and effect relationships to explore how changes in the physical environment (limiting factors, natural disasters) can lead to population changes within an ecosystem.**

**L.6.3.5 Develop and use food chains, webs, and pyramids to analyze how energy is transferred through an ecosystem from producers (autotrophs) to consumers (heterotrophs, including humans) to decomposers.**

**L.6.3.4 Investigate organism interactions in a competitive or mutually beneficial relationship (predation, competition, cooperation, or symbiotic relationships).**

**FORCES**

**P.6.6.2 Use mathematical computation and diagrams to calculate the sum of forces acting on various objects.**

**P.6.6.3 Investigate and communicate ways to manipulate applied/frictional forces to improve movement of objects on various surfaces (e.g., athletic shoes, wheels on cars).**

*Clarification: Experiment to show ways to increase or decrease friction and share results in graphic, verbal, or written form.*

**P.6.6.6 Investigate forces (gravity, friction, drag, lift, thrust) acting on objects (e.g., airplane, bicycle helmets). Use data to explain the differences between the forces in various environments.**

Additional Information:

- Examples of environments could include water, air, and rough/smooth solid surfaces.

**P.6.6.4 Compare and contrast magnetic, electric, frictional, and gravitational forces.**

## **MOTION/ENERGY**

**P.6.6.5 Conduct investigations to predict and explain the motion of an object according to its position, direction, speed, and acceleration.**

**P.6.6.7 Determine the relationships between the concepts of potential, kinetic, and thermal energy.**

*Clarification: Relate potential, kinetic, and thermal energies to the motion of objects.*



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**NEWTON'S LAWS**

**P.6.6.1 Use an engineering design process to create or improve safety devices (e.g., seat belts, car seats, helmets) by applying Newton's Laws of motion. Use an engineering design process to define the problem, design, construct, evaluate, and improve the safety device.\***

*Clarification: This is not an experiment following the steps of the scientific method. The end result should include a prototype.*

Additional Information:

- Newton's Laws were taught in fifth grade but will need to be reviewed.

**SUN/MOON/EARTH RELATIONSHIPS**

**E.6.8.5 Construct explanations for how gravity affects the motion of objects in the solar system and tides on Earth.**

**E.6.8.6 Design models representing motions within the Sun-Earth-Moon system to explain phenomena observed from the Earth's surface (positions of celestial bodies, day and year, moon phases, solar and lunar eclipses, and tides).**

Additional Information:

- Because these models have to demonstrate motion and position, they should be working models. These could include but not be limited to students acting as the celestial bodies.

**E.6.8.7 Analyze and interpret data from the surface features of the Sun (e.g., photosphere, corona, sunspots, prominences, and solar flares) to predict how these features may affect Earth.**

*Clarification: Provide data that the students must examine and then explain the effects on Earth. Features are not limited to what is listed in parenthesis and could also include solar storms and solar winds.*

**ASTRONOMY**

**E.6.8.1 Obtain, evaluate, and summarize past and present theories and evidence to explain the formation and composition of the universe.**

Additional Information:

- Examples of some theories to research could include the Big Bang Theory, Creationism Theory, Plasma Theory, Steady State Theory, etc.

**E.6.8.2 Use graphical displays or models to explain the hierarchical structure (stars, galaxies, galactic clusters) of the universe.**

**E.6.8.4 Obtain and evaluate information to model and compare the characteristics and movements of objects in the solar system (including planets, moons, asteroids, comets, and meteor).**

*Clarification: This is not an individual study of each planet but a comparative study of the celestial objects.*

**E.6.8.3 Evaluate modern techniques used to explore our solar system's position in the universe.**

Additional Information:

- Examples could include but are not limited to optical telescopes (refracting and reflecting like Hubble), radio telescopes, rockets, rovers, satellites, space probes, space shuttle, and space station.

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**INQUIRY**

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Additional Information:

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**CHEMICAL/PHYSICAL CHANGES**

**P.7.5D.3 Collect, organize, and interpret data using various tools (e.g., litmus paper, pH paper, cabbage juice) regarding neutralization of acids and bases using common substances.**

**P.7.5A.1 Collect and evaluate qualitative data to describe substances using physical properties (state, boiling/melting point, density, heat/electrical conductivity, color, and magnetic properties).**

*Clarification: Keep this basic – refer to particles instead of atoms and bonds (these will be used later).*

Additional information:

- Also discuss volume (in with density), soluble, mixtures, malleable, ductile, pH, and freezing point.

**P.7.5A.2 Analyze and interpret qualitative data to describe substances using chemical properties (the ability to burn or rust).**

*Clarification: Keep this basic – refer to particles instead of atoms and bonds (these will be used later).*

Additional information:

- Also discuss combustion, oxidation, tarnish, decomposition, and cooking.

**P.7.5A.3 Compare and contrast chemical and physical properties (e.g., combustion, oxidation, pH, solubility, reaction with water).**

Additional information:

- Discuss endothermic and exothermic.
- Discuss energy transfer with physical properties. Ex: Water (liquid) absorbs energy and turns to water vapor (gas). It can then “transfer back” in the form of releasing thermal energy and turn the gas back into a liquid. An energy change will not reverse a chemical change.

**P.7.5D.1 Analyze evidence from scientific investigations to predict likely outcomes of chemical reactions.**

*Clarification: According to the State Department, this standard is asking students to identify how they know that a chemical reaction has taken place. (for example: presence of gas, color change, presence of smell, new substance created)*

Additional information:

- Use information from labs, graphs from prior investigations, and scientific articles.

**P.7.5D.2 Design and conduct scientific investigations to support evidence that chemical reactions (e.g., cooking, combustion, rusting, decomposition, photosynthesis, and cellular respiration) have occurred.**

Additional information:

- Only cover cooking, combustion, rusting, and decomposition at this point.

**P.7.5B.1 Make predictions about the effect of temperature and pressure on the relative motion of atoms and molecules (speed, expansion, and condensation) relative to recent breakthroughs in polymer and materials science (e.g. self-healing protective films, silicone computer processors, pervious/porous concrete).**

*Clarification: A polymer is a large chemical compound made up of smaller, repeating units. It is used to modify technology to improve the functions and abilities of substances. (You do not have to go in depth with polymers.)*

Additional information:

- *Examples include: small computer units that don't over-heat (large desktop to small computer in a phone or apple watch), protective layers for cell phones to reduce breaking, materials that allow precipitation to flow directly through concrete – thus reducing run-off and erosion, etc.*

**P.7.5B.2 Use evidence from multiple scientific investigations to communicate the relationships between pressure, volume, density, and temperature of a gas.**

Additional information:

- Use graphs, labs, scientific articles, etc. to create a power point, demonstration, lab report, and/or a graph to represent the research.

**P.7.5B.3 Ask questions to explain how density of matter (observable in various objects) is affected by a change in heat and/or pressure.**

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**ATOMS, ELEMENTS, & CHEMICAL EQUATIONS**

**P.7.5C.2 Use informational text to sequence the major discoveries leading to the current atomic model.**

Additional information:

- Allow students to research different discoveries – make sure that they research the Bohr model and the Schrodinger model. They also need to look at how the periodic table was formed and then adjusted – Dmitri Mendeleev and Henry Moseley.

**P.7.5C.1 Develop and use models that explain the structure of an atom.**

Additional information:

- Review the basics: nucleus, protons, neutrons, and electrons
- Discuss the periodic table and the transformation of the order (atomic mass to atomic number).
- Explain valence electrons and how they can be found using the periodic table (octet rule).

**P.7.5C.4 Predict the properties and interactions of elements using the periodic table (metals, non-metals, reactivity, and conductors).**

Additional information:

- Use the chemical and physical properties and the shared characteristics of groups in the periodic table.

**P.7.5C.3 Collect, organize, and interpret data from investigations to identify and analyze the relationships between the physical and chemical properties of elements, atoms, molecules, compounds, solutions, and mixtures.**

Additional information:

- Discuss how valence electrons and bonding can change the properties of the compounds, solutions, and mixtures (this can include table salt, water, fluoride, etc...)

**P.7.5C.5 Describe concepts used to construct chemical formulas (e.g. CH<sub>4</sub>, H<sub>2</sub>O) to determine the number of atoms in a chemical formula.**

Additional information:

- Also include the formulas for table salt, ozone, oxygen gas, sugar, carbon dioxide, etc...

**P.7.5C.6 Using the periodic table, make predictions to explain how bonds (ionic and covalent) form between groups of elements (e.g., oxygen gas, ozone, water, table salt, and methane).**

**P.7.5E.3 Compare and contrast balanced and unbalanced chemical equations to demonstrate the number of atoms does not change in the reaction.**

Additional information:

- Describe what a chemical equation is and use the terms reactants, products, yields, and produces.
- Use manipulatives to show the number of atoms (possibly by color) on each side of the equation. Have students compare the numbers of atoms on each side of the yield sign to determine if the equation is balanced or unbalanced.

**P.7.5D.2 Design and conduct scientific investigations to support evidence that chemical reactions (e.g., cooking, combustion, rusting, decomposition, photosynthesis, and cellular respiration) have occurred.**

Additional information:

- Only cover decomposition, photosynthesis, and cellular respiration – using their chemical equation to explain the reactants and products. You can also discuss synthesis and replacement here (will also be used in the cycles during 3<sup>rd</sup> nine weeks).

**P.7.5D.4 Build a model to explain that chemical reactions can store (formation of bonds) or release energy (breaking of bonds).**

*Clarification: When bonds are formed or broken, energy can be stored or released for both! Include endothermic, exothermic, photosynthesis, and respiration.*

**P.7.5E.1 Conduct simple scientific investigations to show that total mass is not altered during a chemical reaction in a closed system. Compare results of investigations to Antoine-Laurent Lavoisier’s discovery of the law of conservation of mass.**

Additional information:

- You can show the students the mathematical procedure for calculating total mass on each side of the equation. You can demo a small lab (Ex: Use baking soda and vinegar (measure the mass) – have them “react” with each other and then measure the mass again. YOU MUST use a container with a balloon or some sort of closure to keep in the gases. Compare the measurements.

**P.7.5E.2 Analyze data from investigations to explain why the total mass of the product in an open system appears to be less than the mass of reactants.**

Additional information:

- Repeat the lab from above (baking soda and vinegar), but do not close it in. Allow the gas to escape. Then compare the measurements and discuss how the gases can’t be measured once they “escape” into the air.

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**THE CYCLES OF MATTER & EARTH'S TILT**

**L.7.3.1 Analyze diagrams to provide evidence of the importance of the cycling of water, oxygen, carbon, and nitrogen through ecosystems to organisms.**

Additional information:

- Review ecosystems – terrestrial, freshwater, marine, and food webs.
- When discussing cycles, use the chemical formulas and equations as much as possible (O<sub>2</sub>, CO<sub>2</sub>, CH<sub>4</sub>, etc.).

**L.7.3.2 Analyze and interpret data to explain how the processes of photosynthesis, and cellular respiration (aerobic and anaerobic) work together to meet the needs of plants and animals.**

Additional information:

- Look at the products and reactants of photosynthesis and cellular respiration and how they are used by plants and animals.

**L.7.3.3 Use models to describe how food molecules (carbohydrates, lipids, proteins) are processed through chemical reactions using oxygen (aerobic) to form new molecules.**

Additional information:

- Food molecules are broken down and rearranged through chemical reactions forming new molecules that support cell growth and/or release of energy.
- Specific details of the biochemical steps of breaking down food, or the resulting molecules (e.g., carbohydrates are broken down into monosaccharides) are bit expected to be covered.

**L.7.3.4 Explain how disruptions in cycles (e.g., water, oxygen, carbon, and nitrogen) affect biodiversity and ecosystem services (e.g., water, food, and medications) which are needed to sustain human life on Earth.**

Additional information:

- Some examples to include: deforestation, pollution, invasive species, flooding, drought, global warming, permafrost, fossil fuel and carbon emissions, destruction of wetlands, etc..

**L.7.3.5 Using an engineering design process, create a solution for sustaining the health of ecosystems to maintain biodiversity and the resources needed by humans for survival (e.g. water purification, nutrient recycling, prevention of soil erosion, and prevention or management of invasive species).**

**E.7.9C.1 Construct models and diagrams to illustrate how the tilt of Earth's axis results in differences in intensity of sunlight on the Earth's hemispheres throughout the course of one full revolution around the Sun.**

Additional information:

- Review heat transfer.



**E.7.9C.2 Investigate how variations of sunlight intensity experienced by each hemisphere (to include the equator and poles) create the four seasons.**

**E.7.9A.4 Construct an explanation for how climate is determined in an area using global and surface features (e.g. latitude, elevation, shape of the land, distance from water, global winds and ocean currents).**

Additional information:

- Only cover: latitude, elevation, shape of land, and distance from water.
- Also include altitude, marine climate, and continental climate.

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**WEATHER**

**E.7.9A.2 Analyze evidence to explain the weather conditions that result from the relationship between the movement of water and air masses.**

Additional information:

- Review air pressure, water in the atmosphere (water cycle), how clouds form, precipitation, humidity, fog, layers of air masses give off different temperatures (thus different precipitation), etc..

**E.7.9A.4 Construct an explanation for how climate is determined in an area using global and surface features (e.g. latitude, elevation, shape of the land, distance from water, global winds and ocean currents).**

Additional information:

- Only cover global winds and ocean currents.
- Include the California Current and the Gulf Stream. Tell how they contribute to the weather patterns in the United States.
- Tell how the Coriolis Effect impacts winds and ocean currents.

**E.7.9A.5 Analyze models to explain the cause and effect relationship between solar energy and convection and the resulting weather patterns and climate conditions.**

Additional information:

- Local Winds, Sea Breeze, Land Breeze, Monsoons, Lake-Effect Snows, etc...

**E.7.9A.1 Analyze and interpret weather patterns from various regions to differentiate between weather and climate.**

Additional information:

- Look globally – the parts of countries that share climate zones, but have different weather because of the impacts of ocean currents and global winds.

**E.7.9A.3 Interpret atmospheric data from satellites, radar, and weather maps to predict weather patterns and conditions.**

Additional information:

- Look at the United States only here!

**E.7.9A.6 Research and use models to explain what type of weather (thunderstorms, hurricanes, and tornadoes) results from the movement and interactions of air masses, high and low pressure systems, and frontal boundaries.**

**E.7.9A.7 Interpret topographic maps to predict how local and regional geography affect weather patterns and make them difficult to predict.**

**E.7.9B.1 Read and evaluate scientific or technical information assessing the evidence and bias of each source to explain the causes and effects of climate change.**

Additional information:

- Research different viewpoints and determine validity.

**E.7.9B.2 Interpret data about the relationship between the release of carbon dioxide from burning fossil fuels into the atmosphere and the presence of greenhouse gases.**

**E.7.9B.3 Engage in scientific argument based on current evidence to determine whether climate change happens naturally or is being accelerated through the influence of man.**

Additional information:

- Debate, create a persuasive essay, Socratic seminar, etc...

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Additional Information:

- Lab Safety
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- Graphing

**LIGHT WAVES**

**P.8.6.1 Collect, organize, and interpret data about the characteristics of sound and light waves to construct explanations about the relationship between matter and energy.**

Additional Information:

- Focus on light to include brightness, color, requires medium or not, bending.
- Label parts of a wave.
- Light wave implies the entire electromagnetic spectrum is covered.
- Waves transfers energy to other forms of matter.

**P.8.6.3 Conduct simple investigations about the performance of waves to describe their behavior (e.g., refraction, reflection, transmission, and absorption) as they interact with various materials (e.g., lenses, mirrors, and prisms).**

Additional Information:

- Focus on light
- Electromagnetic spectrum -draw, color and label

**P.8.6.6 Obtain and evaluate scientific information to explain the relationship between seeing color and the transmission, absorption, or reflection of light waves by various materials.**

**SOUND**

**P.8.6.1 Collect, organize, and interpret data about the characteristics of sound and light waves to construct explanations about the relationship between matter and energy.**

Additional Information:

- Focus on sound: requires a medium or not and bending.
- Label parts of a wave.
- Waves transfers energy to other forms of energy.

**P.8.6.3 Conduct simple investigations about the performance of waves to describe their behavior (e.g., refraction, reflection, transmission, and absorption) as they interact with various materials (e.g., lenses, mirrors, and prisms).**

Additional Information:

- Focus on sound only

## **WAVES**

**P.8.6.4 Use scientific processes to plan and conduct controlled investigations to conclude sound is a wave phenomenon that is characterized by amplitude and frequency.**

Additional Information:

- Properties of waves
- Virtual oscilloscope is helpful to determine waves frequencies and amplitudes
- Tuning forks, stringed instruments, add lab

**P.8.6.5 Conduct scientific investigations that describe the behavior of sound when resonance changes (e.g., waves in a stretched string and design of musical instruments).**

Additional Information:

- Possible materials to be used: metal rods, guitars, virtual sound labs, different size PVC.

**P.8.6.2 Investigate research-based mechanisms for capturing and converting wave energy (frequency, amplitude, wavelength, and speed) into electrical energy.**

Additional Information:

- The wave energy refers to ocean waves converted to electrical energy. May include: oscillating water column, pendulum system, power buoy, Salter's Duck system, Pelamis Wave Energy Converter, Wave Roller Systems, Archimedes Wave Swing, and others.

**P.8.6.7 Research the historical significance of wave technology to explain how digitized tools have evolved to encode and transmit information (e.g., telegraph, cell phones, and wireless computer networks).**

**P.8.6.8 Compare and contrast the behavior of sound and light waves to determine which types of waves need a medium for transmission.**

Additional Information:

- Dual properties of light- Rays vs Waves
- Light through a wall vs sound
- Compare/Contrast speed of sound vs light

## **GENETICS**

**L.8.2B.2 Use various scientific resources to research and support the historical findings of Gregor Mendel to explain the basic principles of heredity.**

Additional Information:

- Define: heredity, alleles, homozygous, heterozygous, traits, genes, etc.
- Law of Segregation
- Dominant/Recessive
- Mendel's pea plant experiments

**L.8.2B.3 Use mathematical and computational thinking to analyze data and make predictions about the outcome of specific genetic crosses (monohybrid Punnett Squares) involving simple dominant/recessive traits.**

**L.8.2A.1 Obtain and communicate information about the relationship of genes, chromosomes, and DNA, and construct explanations comparing their relationship to inherited characteristics.**

Additional Information:

- Cell organelle overview
- DNA pathway to traits (DNA, RNA, Protein, Trait)
- Heredity
- Walter Sutton Chromosome Theory of Inheritance

## **REPRODUCTION**

**L.8.2A.2 Create a diagram of mitosis and explain its role in asexual reproduction, which results in offspring with identical genetic information.**

*Clarification: Students can draw, color, label, arrange, parts of cell cycle to show phases.*

Additional Information:

- Cell cycle
- Mitosis
- Cells Alive is a good resource

**L.8.2A.3 Construct explanations of how genetic information is transferred during meiosis.**

*Clarification: Draw or build each phase of meiosis*

Additional Information:

- Explain meiosis phases
- Cross-over- creates diversity
- Law of Independent Assortment

**L.8.2A.4 Engage in discussion using models and evidence to explain that sexual reproduction produces offspring that have a new combination of genetic information different from either parent.**

Additional Information:

- Model meiosis
- Genetic diversity occurs through sexual reproduction

**L.8.2A.5 Compare and contrast advantages and disadvantages of asexual and sexual reproduction.**

Additional Information:

- Topic not limited to these scenarios or solely based on humans
- Debate
- Venn diagram
- Socratic seminar

**Review/Assess for Benchmark**



**SCIENCE MS COLLEGE and CAREER READINESS STANDARDS  
MADISON COUNTY SCHOOL DISTRICT  
8<sup>TH</sup> GRADE: 2<sup>ND</sup> NINE WEEKS**

**GENETICS**

***L.8.2B.1 Construct an argument based on evidence for how environmental and genetic factors influence the growth of organisms.***

Additional Information:

- Nature vs Nurture
- Lack/ abundance: water, food, habitat, mates, pollution, disease
- Cross-species pollination or breeding
- Topics are not limited to these
- Provide real-world scenarios (snakehead fish, gills to lungs, etc.)

***L.8.2C.1 Communicate through diagrams that chromosomes contain many distinct genes and that each gene holds the instructions for the production of specific proteins, which in turn affects the traits of the individual (not to include transcription or translation).***

Additional Information:

- Draw, label, place pictures in order
- Demonstrate DNA unravelling, separating, to create RNA, which moves to ribosomes to make protein

***L.8.2C.2 Construct scientific arguments from evidence to support claims about the potentially harmful, beneficial, or neutral effects of genetic mutations on organisms.***

Additional Information:

- Socratic seminar, report, debate
- Mutations are found throughout all species.

***L.8.2B.4 Debate the ethics of artificial selection (selective breeding, genetic engineering) and the societal impacts of humans changing the inheritance of desired traits in organisms.***

Additional Information:

- Pedigrees charts
- Advantages and disadvantages
- Inbreeding/Hybridization, cloning
- Societal: loss of variety, mutations, disease, cross-species pollination, disrupt food sources, GMO, etc.

## **NATURAL SELECTION**

**L.8.4A.1 Use various scientific resources to analyze the historical findings of Charles Darwin to explain basic principles of natural selection.**

*Clarification: Who was Charles Darwin? What did he propose? What was his evidence? What new evidence has been discovered to better understand organism relationships?*

Additional Information:

- Survival of the fittest
- More offspring are produced than can survive
- Populations change over time (Adaptations)
- Variations that increase reproductive success will be more common in the next generations

**L.8.4A.2 Investigate to construct explanations about natural selection that connect growth, survival, and reproduction to genetic factors, environmental factors, food intake, and interactions with other organisms.**

Additional Information:

- Suggestions- real-world timeline, Socratic seminar, research paper, PowerPoint
- How do these six factors influence natural selection
- Great culminating activity

**L.8.4B.1 Analyze and interpret data (e.g. pictures, graphs) to explain how natural selection may lead to increases and decreases of specific traits in populations over time.**

Additional Information:

- **Good sites: Google** -Data on Natural Selection, What Darwin Finches Can Teach Us

**L.8.4B.2 Construct written and verbal explanations to describe how genetic variations of traits in a population increase some organisms' probability of surviving and reproducing in a specific environment.**

Additional Information:

- *As a suggestion could be taught with L.8.4A.2*

**Review/Assess for Benchmark**

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**EVOLUTION**

***L.8.4B.3* Obtain and evaluate scientific information to explain that separated populations, that remain separated, can evolve through mutations to become a new species (speciation).**

Additional Information:

- How does speciation occur? Why does it occur?

***L.8.4B.4* Analyze displays of pictorial data to compare and contrast embryological and homologous/analogous structures across multiple species to identify evolutionary relationships.**

Additional Information:

- View embryonic traits and differentiate

***E.8.7.3* Construct and analyze scientific arguments to support claims that most fossil evidence is an indication of the diversity of life that was present on Earth and that relationships exist between past and current life forms.**

Additional Information:

- Homologous/Analogous structures

**ENVIRONMENTAL RESOURCES**

***E.8.10.1* Read and evaluate scientific information about advancements in renewable and nonrenewable resources. Propose and defend ways to decrease national and global dependency on nonrenewable resources.**

Additional Information:

- Research renewable/nonrenewable resources

***E.8.10.2* Create and defend a proposal for reducing the environmental effects humans have on Earth (e.g., population increases, consumer demands, chemical pollution, deforestation, and change in average annual temperature).**

Additional Information:

- Discuss pros and cons with students (refrain from bias)

***E.8.10.3* Using scientific data, debate the societal advantages and disadvantages of technological advancements in renewable energy sources.**

Additional Information:

- Cost, land, habitat destruction, extinctions or biodiversity losses
- biomass, geothermal, wind, solar, and hydroelectric

**E.8.10.4 Using an engineering design process, develop a system to capture and distribute thermal energy that makes renewable energy more readily available and reduces human impact on the environment (e.g., building solar water heaters, conserving home energy).\***

**E.8.7.1 Use scientific evidence to create a timeline of Earth's history that depicts relative dates from index fossil records and layers of rock (strata).**

Additional Information:

- Law of Superposition
- Continental drift (plate tectonics)
- Index fossils
- Law of Fossil Succession
- Carbon dating
- Suggestion- perform E.8.7.4

**E.8.7.2 Create a model of the processes involved in the rock cycle and relate it to the fossil record.**

Additional Information:

- Igneous, metamorphic, and sedimentary rocks
- Compaction/Cementation
- Weathering/Erosion
- Potential labs may include starburst, chocolate, crayons etc.

**E.8.7.4 Use research and evidence to document how evolution has been shaped both gradually and through mass extinction by Earth's varying geological conditions (e.g., climate change, meteor impacts, and volcanic eruptions).**

**Review /Assess for benchmark**

**SCIENCE MS COLLEGE and CAREER READINESS STANDARDS  
MADISON COUNTY SCHOOL DISTRICT  
8<sup>TH</sup> GRADE: 4<sup>TH</sup> NINE WEEKS**

**GEOLOGY**

***E.8.9A.1 Investigate and explain how the flow of Earth’s internal energy drives the cycling of matter through convection currents between Earth’s surface and the deep interior causing plate movements.***

Additional Information:

- Mid-ocean ridge, subduction zones, sea floor spreading, constructive/destructive forces
- Asthenosphere vs lithosphere

***E.8.9A.2 Explore and debate theories of plate tectonics to form conclusions about past and current movements of rocks at Earth’s surface throughout history.***

Additional Information:

- Alfred Wegener
- Same fossils found on continents
- Sea floor spreading (plate tectonics)

***E.8.9A.3 Map land and water patterns from various time periods and use rocks and fossils to report evidence of how Earth’s plates have moved great distances, collided, and spread apart.***

Additional Information:

- Alfred Wegener

***E.8.9A.4 Research and assess the credibility of scientific ideas to debate and discuss how Earth’s constructive and destructive processes have changed Earth’s surface at varying time and spatial scales.***

Additional Information:

- Mid-ocean ridge, subduction zones, sea floor spreading, constructive/destructive forces, hot spots, volcanoes, weathering, plate tectonics, etc.
- Asthenosphere vs lithosphere

***E.8.9A.5 Use models that demonstrate convergent and divergent plate movements that are responsible for most landforms and the distribution of most rocks and minerals within Earth’s crust.***

Additional Information:

- Potential lab-edible plate tectonics

***E.8.9A.6 Design and conduct investigations to evaluate the chemical and physical processes involved in the formation of soils.***

Additional Information:

- Leaching- chemical and mechanical weathering, accumulation-additions, Losses- weathering, transformation, translocation

**E.8.9A.7 Explain the interconnected relationship between surface water and groundwater.**

Additional Information:

- Gaining streams, losing streams, and disconnected streams

**E.8.9B.1 Research and map various types of natural hazards to determine their impact on society.**

*Clarification: look at different regions of the world and determine: What natural disasters occur in that region. Which are predictable and which are not?*

Additional Information:

- Ring of Fire, tsunamis, earthquakes, tornado alley, fire zones, flood zones, hurricane zones, droughts, mudslides, etc.

**E.8.9B.2 Compare and contrast technologies that predict natural hazards to identify which types of technologies are most effective.**

Additional Information:

- Weather forecasting, tsunami detection, earthquake detection, volcanic activity
- Drone technology –flood and fire

**E.8.9B.3 Using an engineering design process, create mechanisms to improve community resilience, which safeguard against natural hazards (e.g., building restrictions in flood or tidal zones, regional watershed management, Fire wise construction).\***

**Review/State Test**