PUSD Science District Instructional Guides (Date Updated: 9/13/2019)

Grade Level: 7	**Time: Q1 Weeks/ Days?**
Unit Title: Force and Motion	Cross Cutting Concepts: Patterns; **Cause and Effect;** Scale, Proportion and Quantity; Systems and System Models; Energy and Matter; Stability and Change; **Structure and Function**
Core Ideas for Knowing Science: **P3: Changing the movement of an object requires a net force to be acting it.** **P2: Objects can affect other objects at a distance**	**Core Ideas for Using Science:** U1: Scientists explain phenomena using evidence obtained from observations and or scientific investigations. Evidence may lead to developing models and/or theories to make sense of phenomena. As new evidence is discovered, models and theories can be revised.
Essential Questions: How do Newton's Laws apply to systems of two or more objects? **How can knowledge of force and motion help us predict the behavior of objects?**	

Learning Progression: Electric and magnetic (electromagnetic) forces can be attractive or repulsive, and their sizes depend on the magnitudes of the charges, currents, or magnetic strengths involved and on the distances between the interacting objects. Gravitational forces are always attractive. There is a gravitational force between any two masses, but it is very small except when one or both of the objects have large mass—for example, Earth and the sun. Long-range gravitational interactions govern the evolution and maintenance of large-scale systems in space, such as galaxies or the solar system, and determine the patterns of motion within those structures. - For any pair of interacting objects, the force exerted by the first object on the second object is equal in strength to the force that the second object exerts on the first but in the opposite direction. The motion of an object is determined by the sum of the forces acting on it; if the total force on the object is not zero, its motion will change. The greater the mass of the object, the greater the force needed to achieve the same change in motion. For any given object, a larger force causes a larger change

Standards	**Objectives (I Can)**	**Key Vocabulary**	**Resources (Activities/Lessons/ Experiments)**	**Assessments**

7.P3U1.4 Use non-algebraic mathematics and computational thinking to explain Newton's laws of motion. 7.P2U1.2 Develop and use a model to predict how forces act on objects at a distance.	I can determine the meaning of the following terms through investigation: Force Motion Mass I can conduct an experiment to explore and describe balanced and unbalanced forces. I can explain the conditions under which an object will continue in its state of motion (Newton's 1st Law of Motion) I can explain how the acceleration of a body is dependent on its mass and the net applied force (Newton's 2nd Law of Motion). (CC:Patterns, Cause & Effect) I can determine the meaning of the following terms through investigation: Inertia Mass I can explain forces as interactions between bodies (Newton's 3rd Law of	Motion Force Mass Orientation Balanced forces Unbalanced forces Friction Proportional relationship between mass and acceleration Newtons Force fields Weight Distance Energy transfer Inertia Acceleration Gravity Gravitational force	PHET Simulation - Forces and Motion Basics Broom Ball - Good Activity for introducing the Laws of Motion. Can be used for students to create their own "rules" for the movement of objects based off observations from the game. PHET Simulation- Gravity & Force Lab- Newton's 3rd Law	

Grade Level: 7	Time: Q2 Weeks/ Days?
Unit Title: Electromagnetic and Gravitational Forces	Cross Cutting Concepts: **Patterns; Cause and Effect;** Scale, Proportion and Quantity; Systems and System Models; Energy and Matter; Stability and Change; **Structure and Function**
Core Ideas for Knowing Science: P2: Objects can affect other objects at a distance P3: Changing the movement of an object requires a net force to be acting it.	**Core Ideas for Using Science:** P3: Changing the movement of an object requires a net force to be acting it. P2: Objects can affect other objects at a distance
Essential Questions: How can one describe physical interactions between objects and within systems of objects? **How can energy be transferred from one object or system to another?**	
Learning Progression: Electric and magnetic (electromagnetic) forces can be attractive or repulsive, and their sizes depend on the magnitudes of the charges, currents, or magnetic strengths involved and on the distances between the interacting objects. Gravitational forces are always attractive. There is a gravitational force between any two masses, but it is very small except when one or both of the objects have large mass—for example, Earth and the sun. Long-range gravitational interactions govern the evolution and maintenance of large-scale systems in space, such as galaxies or the solar system, and determine the patterns of motion within those structures.	

Standards	Objectives (I Can)	Key Vocabulary	Resources (Activities/Lessons/ Experiments)	Assessments

7.P2U1.1 Collect and analyze data demonstrating how electromagnetic forces can be attractive or repulsive and can vary in strength. 7.P3U1.3 Plan and carry out an investigation that can support an evidence-based explanation of how objects on Earth are affected by gravitational force.	I can conduct an investigation to identify properties of magnets addressing the following: Size Magnitude (strength) Attraction (positive and negative charges) Repulsion I can conduct an investigation to identify properties of electromagnets addressing the following: Size Magnitude (strength) Attraction (positive and negative charges) Repulsion I can identify trends and patterns to explain the relationship between distance and magnetic strength. I can define attractive and repulsive forces. I can compare and contrast attractive and repulsive forces.	Electromagnetic Force Attract Attraction Repel Repulsive Proportional Magnitude Charge Resistance Currents Gravity Mass Weight Mass-dependent Interactions Trends magnetic composition Magnetic forces Magnetic poles Magnetic fields Magnetic attraction static electricity circuits conductors Insulators electric charge (protons, electrons) magnitude of charge electromagnet current magnetic strength	PHET Simulation- Electromagnetic Forces PHET Simulation- Magnetic Fields DiscoveryEducation Key Phrases: “Magnetic Forces” “Electromagnets” Discovery of Electromagnetism - Article about Oersted Electromagnetic Reading with Review NGSS Electromagnetic Relationships Activity Earth’s Magnetic Field Reading	

Grade Level: 7	**Time: Q3 Weeks/ Days?**
Unit Title: Abiotic Energy Flow (1 of 3)	Cross Cutting Concepts: **Patterns**; **Cause and Effect; Systems** and System Models; Energy and Matter; **Structure and Function**
Core Ideas for Knowing Science: **E1: The composition of the Earth and its atmosphere and the natural and human processes occurring within them shape the Earth’s surface and its climate.**	**Core Ideas for Using Science:** U1: Scientists explain phenomena using evidence obtained from observations and or scientific investigations. Evidence may lead to developing models and or theories to make sense of phenomena. As new evidence is discovered, models and theories can be revised.
Essential Questions: How do Earth’s major systems (atmosphere, hydrosphere, and geosphere) interact?	

Learning Progression: Earth processes are the result of energy flowing and matter cycling within and among the planet's systems. This energy is derived from the sun and Earth's hot interior. The energy that flows and matter that cycles produce chemical and physical changes in Earth's materials and living organisms.(p.181) Radioactive decay of material inside the Earth since it was formed is its internal source of energy. Radiation from the Sun provides the energy that enables plants containing chlorophyll to make glucose through the process of photosynthesis. (p. 24)				
Standards	**Objectives (I Can)**	**Key Vocabulary**	**Resources (Activities/Lessons/ Experiments)**	**Assessments**
7.E1U1.5 Construct a model that shows the cycling of matter and flow of energy in the atmosphere, hydrosphere, and geosphere.	I can describe physical and chemical changes of matter in Earth's materials including the following: Rock cycle Water cycle I can describe the flow of energy in the atmosphere. I can compare and contrast rocks and minerals. (how they form, where they are formed, etc.) I can explain the rock cycle. I can distinguish the components and characteristics of the rock cycle for the following types of rocks: igneous metamorphic sedimentary I can identify and describe the following: atmosphere hydrosphere geosphere I can describe the properties and the composition of the layers of the atmosphere. I can create a model demonstrating the flow of energy through Earth's abiotic features.	Chemical changes Physical changes Radioactive decay atmosphere hydrosphere geosphere hydrologic cycles Volcano Magma Lava		

Grade Level: 7	Time: Q3 Weeks/ Days?
Unit Title: Abiotic Energy Flow (2 of 3)	Cross Cutting Concepts: **Patterns**; **Cause and Effect;** scale, proportion and quantity; **Systems** and System Models; Energy and Matter; stability and change; **Structure and Function**
Core Ideas for Knowing Science: **E1: The composition of the Earth and its atmosphere and the natural and human processes occurring within them shape the Earth's surface and its climate.**	**Core Ideas for Using Science:** U1: Scientists explain phenomena using evidence obtained from observations and or scientific investigations. Evidence may lead to developing models and or theories to make sense of phenomena. As new evidence is discovered, models and theories can be revised.
Essential Questions: How do the materials in and on Earth's crust change over time? **How does the movement of tectonic plates impact the surface of Earth?**	
Learning Progression: Plate tectonics is the unifying theory that explains the past and current movements of the rocks at Earth's surface and provides a framework for understanding its geological history. Plate movements are responsible for most continental and ocean floor features and for the distribution of most rocks and minerals within Earth's crust. Maps of ancient land and water patterns, based on investigations of rocks and fossils, make clear how Earth's plates have moved great distances, collided, and spread apart. (p. 1	

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7.E1U1.6 Construct a model to explain how the distribution of fossils and rocks, continental shapes, and seafloor structures provides evidence of the past plate motions.	I can analyze the evidence that lithospheric plate movements occur. I can explain lithospheric plate movement as a result of convection. I can create a model of plate boundary movements to their resulting landforms, including: mountains faults rift valleys trenches volcanoes I can interpret how the rock record shows that environmental conditions have changed over geologic and recent time to formulate conclusions. I can describe how the fossil record shows that environmental conditions have changed over geologic and recent time. I can conceptualize of the following plate boundaries: Divergent Convergent Transverse I can compare and contrast the connection between the fossil record and plate tectonics. I can describe the distribution of seafloor structures (e.g., volcanic ridges at the centers of oceans, trenches at the edges of continents) I can make connections on the patterns of ages of rocks of the seafloor (youngest ages at the ridge, oldest ages at the trenches) by analyzing inquiry data and/or scientific diagrams. I can evaluate the relationship between new crust formation and the destruction of seafloor trenches in relation to the fossil record as a system.	Continental Crust Oceanic Crust Continental Drift Pangaea Mid Ocean Ridges Ocean Trenches Sea Floor Spreading Divergent Boundary Transform Boundary Continental-Continental Collision Oceanic-Oceanic Subduction Oceanic-Continental Subduction Earthquake Seismic waves Focus Epicenter Volcano Lithosphere Crust Seafloor Fossil record Hot Spots Subduction Convergent Transverse Mountains Faults Rift valleys Trenches		

Grade Level: 7		**Time: Q3 Weeks/ Days?**		
Unit Title: Abiotic Energy Flow (3 of 3)		Cross Cutting Concepts: **Patterns**; **Cause and Effect;** scale, proportion and quantity; Systems and System Models; Energy and Matter; **Structure and Function**		
Core Ideas for Knowing Science: E1 The composition of the Earth and its atmosphere and the natural and human processes occurring within them shape the Earth's surface and its climate.		**Core Ideas for Using Science:** U1: Scientists explain phenomena using evidence obtained from observations and or scientific investigations. Evidence may lead to developing models and or theories to make sense of phenomena. As new evidence is discovered, models and theories can be revised.		
Essential Questions: **What factors interact and influence weather?**				
Learning Progression: Weather and climate are influenced by interactions involving sunlight, the ocean, the atmosphere, ice, landforms, and living things. These interactions vary with latitude, altitude, and local and regional geography, all of which can affect oceanic and atmospheric flow patterns. Because these patterns are so complex, weather can be predicted only probabilistically. The ocean exerts a major influence on weather and climate by absorbing energy from the sun, releasing it over time, and globally redistributing it through ocean currents. Greenhouse gases in the atmosphere absorb and retain the energy radiated from land and ocean surfaces, thereby regulating Earth's average surface temperature and keeping it habitable. (p. 188)				
Standards	**Objectives (I Can)**	**Key Vocabulary**	**Resources (Activities/Lessons/ Experiments)**	**Assessments**

7.E1U2.7 Analyze and interpret data to construct an explanation for how advances in technology has improved weather prediction.	I can identify the impact of the following factors on weather and climate: Sunlight Ocean Atmosphere Ice Landforms Living things I can describe how oceanic and atmospheric flow patterns are impacted by: Latitude Altitude Geography I can compare and contrast the past and current technologies used to predict weather. I can describe greenhouse gases and their effect on Earth. I can evaluate the impact of energy radiated from land and ocean surfaces on Earth. I can analyze and interpret data that shows evidence of changes in Earth's climate	Climate Greenhouse gases Latitude Altitude Atmosphere Weather sunlight ocean		

Grade Level: 7	**Time: Q4 Weeks/ Days?**
Unit Title: Biotic Systems (1 of 2)	Cross Cutting Concepts: **Patterns**; **Cause and Effect;** scale, proportion and quantity; Systems and System Models; Energy and Matter; **Structure and Function**

Core Ideas for Knowing Science: **L1: Organisms are organized on a cellular basis and have a finite life span.**	**Core Ideas for Using Science:** U1: Scientists explain phenomena using evidence obtained from observations and or scientific investigations. Evidence may lead to developing models and or theories to make sense of phenomena. As new evidence is discovered, models and theories can be revised.
Essential Questions: How do the structures of organisms enable life's functions? **How do plants produce their own energy?** **How do organisms grow and develop?**	

Learning Progression: All living organisms are made of one or more cells, which can be seen only through a microscope. All the basic processes of life are the results of what happens inside cells. Cells divide to replace aging cells and to make more cells in growth and in reproduction. Food is the energy source they need in order to carry out these and other functions. Some cells in multicellular organisms, as well as carrying out the functions that all cells do, are specialized; for example, muscle, blood and nerve cells carry out specific functions within the organism. Cells are often aggregated into tissues, tissues into organs, and organs into organ systems. In the human body, systems carry out such key functions as respiration, digestion, elimination of waste and temperature control. The circulatory system takes material needed by cells to all parts of the body and removes soluble waste to the urinary system. Stem cells, which are not specialized, are capable of repairing tissues by being programmed for different functions. Cells function best in certain conditions. Both single cell and multi-cellular organisms have mechanisms to maintain temperature and acidity within certain limits that enable the organism to survive. (p. 26)

Standards	Objectives (I Can)	Key Vocabulary	Resources (Activities/Lessons/ Experiments)	Assessments

7.L1U1.8 Obtain, evaluate, and communicate information to provide evidence that all living things are made of cells, cells come from existing cells, and cells are the basic structural and functional unit of all living things.. 7.L1U1.9 Construct an explanation to demonstrate the relationship between major cell structures and cell functions (plant and animal).	I can investigate organisms using a microscope. I can explain how the processes of life begins. I can conduct an investigation describing different types of cells within one multicellular organism. I can label and explain the function the structures within a cell. I can describe how organelles work together to perform a function. Differentiate between plant and animal cells. I can explain the process of cell division (Boundary: just discuss purpose of mitosis). I can describe the purpose of cell reproduction. (Boundary: just discuss purpose of meiosis) I can summarize food as an energy source to carry out functions. I can create a model to describe the interconnectivity of structures and functions of a cell.	Cell Theory Cell Wall Cell Membrane Nucleus Cells Structure Function Organism Tissue Respiration Digestion Circulation Stem Cells Organelles Cell division Mitosis Meiosis Multicellular organ system		

Unit Title: Biotic Systems (2 of 2)	Cross Cutting Concepts: **Patterns**; **Cause and Effect;** scale, proportion and quantity; Systems and System Models; Energy and Matter; **Structure and Function**
Core Ideas for Knowing Science: **L1: Organisms are organized on a cellular basis and have a finite life span.**	**Core Ideas for Using Science:** U1: Scientists explain phenomena using evidence obtained from observations and or scientific investigations. Evidence may lead to developing models and or theories to make sense of phenomena. As new evidence is discovered, models and theories can be revised.
Essential Questions: **How do internal and external factors affect an organism's stability?** **How have living organisms changed the Earth?** **How have Earth's changing conditions impacted living organisms?**	
Learning Progression: All living things are made of cells. Life is the quality that distinguishes living things - composed of living cells, from nonliving objects or those that have died. While a simple definition of life can be difficult to capture, all living things - that is to say all organisms -can be characterized by common aspects of their structure and functioning. Organisms are complex, organized and built on a hierarchical foundation of elements and atoms, to cells and systems of individual organisms to species and populations living and interacting in complex ecosystems. Organisms range in composition from a single cell (unicellular microorganisms) to multicellular organisms, in which different groups of large number of cells work together to form systems of tissues and organs (e.g. circulatory, respiratory, nervous, musculoskeletal), that are specialized for particular functions. Organisms respond to stimuli from their environment and actively maintain their internal environment through homeostasis. (p. 143) In most cases, the energy needed for life is ultimately derived from the sun through photosynthesis (although in some ecologically important cases, energy is derived from reactions involving inorganic chemicals in the absence of sunlight e.g. chemosynthesis). Plants, algae (including phytoplankton), and other energy-fixing microorganisms use sunlight, water and carbon dioxide to facilitate photosynthesis, which stores energy, forms plant matter, releases oxygen, and maintains plants' activities. (p. 147)	

Standards	Objectives (I Can)	Key Vocabulary	Resources (Activities/Lessons/ Experiments)	Assessments

7.L1U1.10 Develop and use a [model] to explain how cells, tissues, and organ systems maintain life (animals). 7.L1U1.11 Explain how organisms maintain internal stability and evaluate the effect of the external factors on organisms' internal stability. 7.L2U1.12 Construct an explanation for how some plant cells convert light energy into food energy.	I can explain the hierarchy of cells, tissues, organs and systems. I can relate the following structures of living organisms to their functions (animals): Respiration (gills, lungs) Digestion (stomach, intestines, elimination of waste) Temperature control Circulation (heart, veins, arteries, capillaries) I can create a system model of human body systems and demonstrate the structure and function of the organs within each system. I can explain the patterns within the levels of organization within an organism. I can describe the properties and functions of stem cells. I can explain how new technology has improved the study of cells through stem cell research. ** I can understand the relationships between structures and functions of organisms. (Plant & Animal Cells) I can evaluate the cause and effect of new technologies on maintaining the homeostasis in humans. I can develop a basic understanding of the role of cells in body systems and how those systems work to support the life functions of the organism. ** I can compare different structures and functions of plants and animals and explain how they help them grow, survive, and reproduce. I can explain how cells use light in photosynthesis and change it to make food. I can relate the following structures of living organisms to their functions (plants): Transportation (stomata, roots, xylem, phloem) Absorption (roots, xylem, phloem) Response to stimuli (phototropism, hydrotropism, geotropism) - roots, xylem, phloem) I can understand how cells provide a	Phototropism Hydrotropism Geotropism Xylem Phloem Stimulus Response Photosynthesis Stability Hierarchy Single Cell Systems of tissues and organs Homeostatsis Photosynthesis	Biotic Systems resources	

Grade Level: 7		Time: Q3 Weeks/ Days?		
Unit Title: Abiotic Energy Flow		Cross Cutting Concepts:		
Core Ideas for Knowing Science:		**Core Ideas for Using Science:**		
Essential Questions:				
Standards	**Objectives (I Can)**	**Key Vocabulary**	**Resources (Activities/Lessons/Experiments)**	**Assessments**

7.P2U1.1 Collect and analyze data demonstrating how electromagnetic forces can be attractive or repulsive and can vary in strength.	I can conduct an investigation to identify properties of magnets addressing the following: Size Magnitude (strength) Attraction (positive and negative charges) Repulsion I can conduct an investigation to identify properties of electromagnets addressing the following: Size Magnitude (strength) Attraction (positive and negative charges) Repulsion I can identify trends and patterns to explain the relationship between distance and magnetic strength. I can define attractive and repulsive forces. I can compare	Electromagnetic Force Attract Attraction Repel Repulsive Proportional Magnitude Charge Resistance Currents Gravity Mass Weight Mass-dependent Interactions Trends magnetic composition Magnetic forces Magnetic poles Magnetic fields Magnetic attraction static electricity circuits conductors Insulators electric charge (protons, electrons) magnitude of charge electromagnet current magnetic strength	PHET Simulation-Electromagnetic Forces PHET Simulation-Magnetic Fields DiscoveryEducation Key Phrases: “Magnetic Forces” “Electromagnets” Discovery of Electromagnetism - Article about Oersted Electromagnetic Reading with Review NGSS Electromagnetic Relationships Activity Earth’s Magnetic Field Reading	