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Physical Science				
2016 Indiana Academic Standards	Clarifying Statements	Vocabulary	Crosscutting Concept	Disciplinary Core Idea
<p>7.PS.1 Draw, construct models, or use animations to differentiate between atoms, elements, molecules, and compounds.</p>	<p>1) Explain that atoms are the building blocks of matter.</p> <p>2) Use diagrams to explain the positions and charges of protons, neutrons, and electrons within an atom.</p> <p>3) Explain that every element is composed of a specific type of atom.</p> <p>4) Explain that a molecule is made of two or more atoms (same or different types of atoms - Example - H₂O and H₂ are both molecules.)</p> <p>5) A compound is two or more elements. (Ex - H₂O or CO₂)</p>	<p>*Matter</p> <p>-Atoms</p> <p>-Protons</p> <p>-Neutrons</p> <p>-Electrons</p> <p>-Molecules</p> <p>-Compounds</p> <p>-Elements</p>		

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<p>7.PS.2 Describe the properties of solids, liquids, and gases. Develop models that predict and describe changes in particle motion, density, temperature, and state of a pure substance when thermal energy is added or removed.</p>	<p>1) List the properties of solids, liquids and gases. Find examples of each state of matter. 2) Explain that adding heat (thermal energy) to a substance increases the speed of the atoms, which eventually alters the substances state of matter (solid -> liquid -> gas). 3) Explain that removing heat (thermal energy) from a substance decreases the speed of the atoms, which eventually alters the substances state of matter (gas -> liquid -> solid). 4) May even discuss evaporation, condensation, sublimation, desublimation, freezing and melting. Provide real-world examples of each.</p>	<p>*Solid -Liquid -Viscosity - Surface tension -Gas -Properties -Thermal energy - evaporation -boiling - condensation - sublimation - freezing - melting</p>		
<p>7.PS.3 Investigate the Law of Conservation of Mass by measuring and comparing the mass of a substance before and after a change of state.</p>	<p>1) Define the Law of Conservation of Mass. 2) Define mass. Use metric units and tools in your measurements.</p>	<p>*Law of Conservation of Mass</p>		

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<p>7.PS.4 Investigate Newton’s first law of motion (Law of Inertia) and how different forces (gravity, friction, push and pull) affect the velocity of an object.</p>	<p>1) Newton’s first law of motion states that an object at rest stays at rest and an object in motion stays in motion with the same speed and in the same direction unless acted upon by an unbalanced force. 2) Relate Newton’s first law of motion to real-world situations such as the pulling a tablecloth from under plates, the importance of wearing a seatbelt, objects in space, etc. 3) Use of free body diagrams may help students understand that multiple forces act on an object at a given time.</p>	<p>*Isaac Newton *Balanced forces *Unbalanced forces *Motion *Gravity *Friction *Push or Pull force *Vectors</p>		
<p>7.PS.5 Investigate Newton’s second law of motion to show the relationship among force, mass and acceleration.</p>	<p>1) Newton's 2nd law of motion is acceleration is produced when a force acts on a mass. The greater the mass (of the object being accelerated) the greater the amount of force needed (to accelerate the object). 2) Calculate the unknown in force = mass * acceleration problems. 3) Relate Newton’s second law of motion to real-world situations such as skiing, driving a car, kicking a football, shooting a basketball, etc.</p>	<p>*F = ma *Force *Mass *Acceleration *Velocity</p>		

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<p>7.PS.6 Investigate Newton’s third law of motion to show the relationship between action and reaction forces.</p>	<p>1) Newton's 3rd law of motion is for every action there is an equal and opposite reaction. 2) Relate Newton’s second third law of motion to real-world situations such as rockets, jumping off a boat onto a pier, water squirting from a hose, or kicking a ball.</p>	<p>*Action *Reaction</p>		
<p>7.PS.7 Construct a device that uses one or more of Newton’s laws of motion. Explain how motion, acceleration, force, and mass are affecting the device.</p>	<p>1) Examples include a balloon rocket, mouse trap cars, catapults, etc.</p>	<p>*Acceleration *Motion *Force *Mass</p>		
<p>7.PS.8 Investigate a process in which energy is transferred from one form to another and provide evidence that the total amount of energy does not change during the transfer when the system is closed. (Law of conservation of energy)</p>	<p>1) Define energy as the capacity to do work. 2) Must be able to prove that the total amount of energy does not change during the transfer in a closed system. 3) In a closed system, matter and energy do not leave the system. The amount of energy remains constant in the system. 4) In an open system, matter and energy can enter or leave the system. Almost all systems are open. 5) Analyze data or investigate how energy is transferred in a closed system versus an open system.</p>	<p>*Law of conservation of energy *Kinetic energy (thermal, motion, sound, electrical, and light) *Potential energy (chemical, nuclear, gravitational, or mechanical) *Open system *Closed system *Energy</p>		

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7.PS.9 Compare and contrast the three types of heat transfer: radiation, convection, and conduction.	1) Define and provide examples of radiation, convection, and conduction. Making popcorn is a good example of all 3: microwave (radiation), air popper (convection), on a stove (conduction).	*Radiation *Convection *Conduction		
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Earth and Space Science				
2016 Indiana Academic Standards	Clarifying Statements	Vocabulary	Crosscutting Concepts	Disciplinary Core Idea
<p>7.ESS.1 Identify and investigate the properties of minerals. Identify and classify a variety of rocks based on physical characteristics from their origin, and explain how they are related using the rock cycle. (i.e. Sedimentary, igneous, and metamorphic rocks)</p>	<ol style="list-style-type: none"> 1) Identify the physical characteristics of minerals. You can use color, streak tests, fracture and cleavage, special properties, luster, density, crystal structure and hardness, 2) Discuss the role minerals play in the human body. 3) Explain the relationship between rocks and minerals. 4) Discuss how geologist classify rocks (mineral composition color, texture, and origin) 5) Contrast the rocks and minerals. 6) Explain the rock cycle. 	<ul style="list-style-type: none"> *Minerals *Rock cycle *Sedimentary rocks *Igneous rocks *Metamorphic rocks *Weathering *Erosion *Heat and pressure 		
<p>7.ESS.2 Construct a model or scale drawing (digitally or on paper), based on evidence from rock strata and fossil records, for how the geologic time scale is used to organize Earth's 4.6 billion-year-old history.</p>	<ol style="list-style-type: none"> 1) Using calculator paper, draw the geological time scale labeling it with major events in the epochs and eras. 2) Investigate an example of an index fossil and how it can be used to help fill in the geologic time scale. 3) Explore the relative scale of time periods (Ex: precambrian vs cenozoic) Think about the proportions of time when constructing. 	<ul style="list-style-type: none"> *Geological time scale *Carbon dating *Decade *Century *Epoch *Era *Period 		

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<p>7.ESS.3 Using simulations or demonstrations, explain continental drift theory and how lithospheric (tectonic) plates have been and still are in constant motion resulting in the creation of landforms on the Earth's surface over time.</p>	<ol style="list-style-type: none"> 1) Explain and discuss evidence that supports the continental drift theory. 2) Discuss the role convection currents in the mantle have on tectonic plate movement. 3) Using data, explore patterns associated with plate movement to draw conclusions about how and where landforms such as earthquakes, volcanoes, mountains, trenches, etc are formed. 4) Discuss and identify which of the landforms are a result of abrupt changes and gradual changes over time. 5) Discuss how volcano eruptions and earthquakes impact the environment and humans. 6) Contrast convergent, divergent, and transform boundaries. Identify the types of landforms they create. 7) Analyze data on the distribution of fossils and rocks, continental shapes and seafloor structures to provide evidence of the past plate motions. 8) Explain how fossils of plants and animals for the same species have been found on separate continents. 9) Explain how sea-floor spreading occurs and its effect on the movement of the tectonic plates. Discuss the cycle of materials that occurs during this process. 	<ul style="list-style-type: none"> *Lithospheric (tectonic) plates *Continental drift theory *Ring of fire *Sea-floor spreading *Convergent boundary *Divergent boundary *Transform boundary *Mountains *Volcanoes *Earthquakes 		
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<p>7.ESS.4 Construct an explanation, based on evidence found in and around Indiana, for how large scale physical processes, such as Karst topography and glaciation, have shaped the land.</p>	<ol style="list-style-type: none"> 1) Define Karst topography as landscape created by groundwater dissolving sedimentary rock such as limestone. 2) Identify landforms, such as caves and sinkholes, created from Karst topography in Southern Indiana. 3) Discuss how glaciation created the Great Lakes. 	<ul style="list-style-type: none"> *Karst topography *Glaciation 		
<p>7.ESS.5 Construct a model, diagram, or scale drawing of the interior layers of the Earth. Identify and compare the compositional (chemical) layers to the mechanical (physical) layers of the Earth's interior including magnetic properties.</p>	<ol style="list-style-type: none"> 1) Identify the compositional (chemical) layers of the Earth's interior as the crust (oceanic and continental), mantle, and core. Each of these layers have their own specific chemical makeup. 2) Discuss evidence (rock samples and seismic wave data) that supports the how the scientific community knows the composition of each layer of the earth's interior. 3) Investigate the magnetic field of the Earth and demonstrate that it is detectable with a compass. 4) Identify to the mechanical (physical) layers of the Earth's interior as the crust, lithosphere, asthenosphere, mesosphere, outer core, and inner core. 5) Discuss or investigate the effects of convection currents in the outer core and asthenosphere. 	<ul style="list-style-type: none"> *Crust - continental and oceanic *Mantle - lithosphere, asthenosphere, mesosphere *Core - outer and inner *Convection currents *Seismic waves *Elements 		

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<p>7.ESS.6 Research common synthetic materials (i.e. plastics, composites, polyester, and alloys) to gain an understanding that synthetic materials do come from natural resources and have an impact on society.</p>	<p>1) Discuss reusing, recycling, and reducing materials. 2) Make connections back to chemical properties of these synthetic materials and why they take longer to break down to understand that they originate from natural resources.</p>	<p>*Reduce *Reuse *Recycle *Synthetic materials *Natural resources</p>		
<p>7.ESS.7 Describe the positive and negative environmental impacts of obtaining and utilizing various renewable and nonrenewable energy resources in Indiana. Determine which energy resources are the most beneficial and efficient.</p>	<p>1) Define and contrast renewable and nonrenewable resources. 2) Discuss the wind farms and solar panels in Indiana and their impact.</p>	<p>*Renewable resources *Nonrenewable resources *Solar energy *Wind energy</p>		

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Life Science				
2016 Indiana Academic Standards	Clarifying Statements	Vocabulary	Crosscutting Concepts	Disciplinary Core Ideas
7.LS.1 Investigate and observe cells in living organisms and collect evidence showing that living things are made of cells. Compare and provide examples of prokaryotic and eukaryotic organisms. Identify the characteristics of living things.	1) List the components of the cell theory. 2) Discuss the characteristics of all living things. 3) Identify the differences between prokaryotes and eukaryotes. 4) Explain the importance of water within all cells and how it is required to carry out many cellular functions.	*Cell - multicellular vs. single-celled *Prokaryotes *Eukaryotes *Cell theory		
7.LS.2 Create a model to show how the cells in multicellular organisms repeatedly divide to make more cells for growth and repair as a result of mitosis. Explain how mitosis is related to cancer.	1) Discuss main outcomes of mitosis - 2 daughter cells - chromosome number is conserved - makes somatic (body) cells 2) Discuss steps of mitosis and interphase 3) Discuss the importance of centrioles in cell division. 4) Define cancer. Explain why cancer is so difficult to cure.	*Interphase and Mitosis - Prophase, Metaphase, Anaphase, Telophase, Cytokinesis -Chromosomes -Centrioles (Centrosomes) -Cytoplasm -Nucleus		

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<p>7.LS.3 Explain how cells develop through differentiation into specialized tissues and organs in multicellular organisms.</p>	<p>1) Explain how stem cells give rise to all other cells. 2) Research the application of stem cells in the medical field. Construct an argument for or against the use of stem cells in medicine.</p>	<p>*Differentiation -Cell -Tissue -Organ -Organ system -Organism -Stem cells</p>		
<p>7.LS.4 Research and describe the functions and relationships between various cell types, tissues, and organs in the immune system, circulatory system and digestive system of the human body.</p>	<p>1) Identify the major body systems and their function. 2) Explain how the body systems function to support the characteristics of all living things. 3) Discuss the structure and importance of red blood cells in the circulatory system. Emphasize that oxygen is what allows cells to make energy. (This will be helpful knowledge for them to build on as the discuss cellular respiration in biology.) 4) Discuss the major cells in the immune system (B-cells, T-cells, helper-T cells, macrophages, antibodies, antigens). This can be connected back to cancer and the bodies response to chemotherapy. 5) Discuss how the digestive system breaks down food into components cells need to produce energy (glucose).</p>	<p>*Circulatory system *Immune system *Digestive system</p>		

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<p>7.LS.5 Compare and contrast the form and function of the organelles found in plant and animal cells.</p>	<p>1) Define and identify each organelle in plant and animal cells. 2) Focus on the role that DNA plays in the cell. 3) Discuss the importance of mitochondria in making energy for the cell.</p>	<ul style="list-style-type: none"> *Nucleus -Nucleous -Cell Membrane -Ribosomes -Golgi apparatus -Cell Wall -Lysosome -Vacuole -Centrioles (Centrosome) -DNA -Cytoplasm -Mitochondria 		
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Engineering				
2016 Indiana Academic Standards	Clarifying Statements	Vocabulary	Crosscutting Concepts	Disciplinary Core Ideas
6-8.E.1 Identify the criteria and constraints of a design to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.				
6-8.E.2 Evaluate competing design solutions using a systematic process to identify how well they meet the criteria and constraints of the problem.				
6-8.E.3 Analyze data from investigations to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.				
6-8.E.4 Develop a prototype to generate data for repeated investigations and modify a proposed object, tool, or process such that an optimal design can be achieved.				

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