

**Eighth Grade
2016 Science Standards Resource Guide**

Physical Science				
2016 Indiana Academic Standards	Clarifying Statements	Vocabulary	Crosscutting Concept	Disciplinary Core Idea
<p>8.PS.1 Create models to represent the arrangement and charges of subatomic particles in an atom (protons, neutrons and electrons). Understand the significance that the currently 118 known chemical elements combine to form all the matter in the universe.</p>	<p>1) Define and identify the position of protons, neutrons, and electrons in an atom. 2) Understand how the current atomic model is a progression of scientific experiments over time (atomic theory). 3) Explain that the attraction between positive protons and negative electrons hold an atom together. 4) Research an element and construct a model (digitally or using tangible materials) of its subatomic particles. Include properties and real-world applications of this element. 5) Research household substances. Identify the elements and combination of elements within the substance.</p>	<p>Atom Element Proton Neutron Electron Subatomic particle atomic theory</p>		
<p>8.PS.2 Illustrate with diagrams (drawings) how atoms are arranged in simple molecules. Distinguish between atoms, elements, molecules, and compounds.</p>	<p>1) Define and find examples of atoms, elements, molecules, and compounds. 2) Count the number of atoms vs. the number of elements in a substance. (This will help with the law of conservation of mass later) 3) Discuss that atoms form chemical bonds to make molecules and compounds.</p>	<p>Atoms Molecules Elements Compounds</p>		

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<p>8.PS.3 Use basic information provided for an element (atomic mass, atomic number, symbol, and name) to determine its place on the Periodic Table. Use this information to find the number of protons, neutrons, and electrons in an atom.</p>	<p>1) Explore how changing the atomic number, changes the element.</p>	<p>Atomic number Atomic mass Chemical symbol Element's name</p>		
<p>8.PS.4 Identify organizational patterns (radius, atomic number, atomic mass, properties and radioactivity) on the Periodic Table.</p>	<p>Exploring Periodic Trends: 1.) Identify the pattern on the periodic table associated with atomic number. 2) Identify the pattern on the periodic table associated with atomic radius. 3) Identify patterns on the periodic table associated with properties. 4) Discuss the properties of 3 main groups - metals, nonmetals, and metalloids. 5) Draw Bohr models/diagrams for elements.</p>	<p>*Chemical properties *Physical properties *Metal *Nonmetal *Metalloid *Electron shells (orbitals)/energy levels *Valence electrons groups (families) periods</p>		
<p>8.PS.5 Investigate the property of density and provide evidence that properties, such as density, do not change for a pure substance.</p>	<p>1) Define density 2) Calculate the density of some pure substances with different masses and volumes. 3) Use student generated data to explore the physical properties of a substance. Water is not a pure substance, but you could use it to show how physical properties remain constant regardless of quality.</p>	<p>*Melting point *Boiling point *Density *Physical properties</p>		

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<p>8.PS.6 Compare and contrast physical change vs. chemical change. Analyze the properties of substances before and after substances interact to determine if a chemical reaction has occurred.</p>	<p>1) Review the different characteristics of a chemical change and a physical change 2.) Using animations, examples, or experiments determine if a chemical reaction has occurred based on observations before and after the reaction.</p>	<ul style="list-style-type: none"> *Physical changes *Chemical changes *Physical properties *Chemical properties *Chemical reaction 		
<p>8.PS.7 Balance chemical equations to show how the total number of atoms for each element does not change in chemical reactions and as a result, mass is always conserved in a closed system. (Law of Conservation of Mass.)</p>	<p>1) Define the Law of conservation of mass. 2) Calculate the total number of atoms for each element on the reactant and product sides of a chemical equation. Balance the chemical equation using coefficients. 3) Investigate the real-world connection of why scientists balance chemical equations. 4) Discuss how the law of conservation of mass is difficult to investigate because most systems are not closed systems. One investigation of a closed system is pouring baking soda from a balloon on top of a water bottle into vinegar. You should be able to collect data that is very close to the same before and after the reaction (minus gas escaping through the permeable balloon).</p>	<ul style="list-style-type: none"> *Law of conservation of mass *Coefficient *Subscript *Reactants *Products *Chemical equation *Atoms *Elements 		

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Earth and Space Science				
2016 Indiana Academic Standards	Clarifying Statements	Vocabulary	Crosscutting Concepts	Disciplinary Core Idea
8.ESS.1 Research global temperatures over the past century. Compare and contrast data in relation to the theory of climate change.	1) Define global warming or climate change. 2) Predict what might happen to the Earth if global temperatures continue to follow their current trend, including impacts on the environment and human populations. 3) Propose a plan to prevent those changes in the environment and on human populations.	*Climate change (global warming) *Greenhouse effect		
8.ESS.2 Create a diagram or carry out a simulation to describe how water is cycled through the earth's crust, atmosphere and oceans. Explain how the water cycle is driven by energy from the sun and the force of gravity.	1) Draw upon students' past knowledge of energy and matter being cycled through the environment with water also being cycled through the environment. Remind students that energy and matter are neither lost or gained just transferred.	*Water cycle *Transpiration *Precipitation *Condensation *Evaporation *Gravity		

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<p>8.ESS.3 Research how human consumption of finite natural resources (i.e. coal, oil, natural gas, and clean water) and human activities have had an impact on the environment (i.e. causes of air, water, soil, light, and noise pollution).</p>	<p>1) Make a connection between industrialization and decreased habitat for native species.</p> <p>2) Identify, explain and discuss the effects that human activities have on local ecosystems and the biosphere as a whole.</p> <p>3) Create a plan to reduce and eliminate these negative human impacts on the environment and encourage sustainability.</p>	<ul style="list-style-type: none"> *Urban sprawl *Suburbanization *Land degradation *Native species *Invasive species *Desertification *Deforestation *Air pollution *Water pollution *Eutrophication *Acid rain *Sustainability *Conservation *Recycle *Natural resource *Renewable resource *Nonrenewable resource 		
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Life Science				
2016 Indiana Academic Standards	Clarifying Statements	Vocabulary	Crosscutting Concepts	Disciplinary Core Ideas
8.LS.1 Compare and contrast the transmission of genetic information in sexual and asexual reproduction. Research organisms that undergo these two types of reproduction.	1) Outline the major differences in the outcomes of sexual and asexual reproduction. 2) Use animations or videos to aid in the research of organisms that undergo these types of reproduction. 3) Explain that reproduction is a characteristic of all living things and allow a species survive. Build upon students prior knowledge about characteristics of living things.	*Asexual reproduction *Sexual reproduction *Genetic variation *Diversity		
8.LS.2 Demonstrate how genetic information is transmitted from parent to offspring through chromosomes via the process of meiosis. Explain how living things grow and develop.	1) Define meiosis and outline the major outcomes of the process (4 cells produced, genetic variation, chromosome number is halved, and gametes being produced.) 2) Remember to contrast meiosis to mitosis. This will allow students to differentiate between the two process and build upon their 7th grade knowledge.	*Meiosis *Gametes *Genetic variation *Chromosome number halved		

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<p>8.LS.3 Create and analyze Punnett squares to calculate the probability of specific traits being passed from parents to offspring using different patterns of inheritance.</p>	<p>1) Discuss Gregor Mendel’s pea plants experiments. 2) Define and practice all vocabulary (ex: genotype, phenotype, allele, Dominant, Recessive etc) 3) Use common phenotypes to create and analyze the probability of possible genotypes for a trait. 4) Define, compare, and contrast different patterns of inheritance: complete dominance, codominance, and incomplete dominance</p>	<p>*Dominant *Recessive *Homozygous/Purebred *Heterozygous/Hybrid *Allele *Gene *Genotype *Phenotype *Trait *Gregor Mendel</p>		
<p>8.LS.4 Differentiate between and provide examples of acquired and genetically inherited traits.</p>	<p>1) Explain how Inherited traits are coded by your DNA and an organism inherits them from their parents 2) Explained how acquired traits are developed over the course of an organism's life 3) Acquired traits are NOT DNA/genes</p>	<p>*Inherited traits *Learned traits *Behavioral traits</p>		
<p>8.LS.5 Explain how factors affecting natural selection (competition, genetic variations, environmental changes, and overproduction) increase or decrease a species’ ability to survive and reproduce.</p>	<p>1) Natural selection is the mechanism by which species evolve over time. 2) Discuss 4 factors and provide examples of each of the factors. 3.) Use real world examples or activities that help students understand the impact on population.</p>	<p>*Evolution *Natural selection *Genetic variation *Competition *Environmental changes *Overproduction *Mutations *Extinction</p>		

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<p>8.LS.6 Create models to show how the structures of chromatin, chromosomes, chromatids, genes, alleles and deoxyribonucleic acid (DNA) molecules are related and differ.</p>	<p>1) Define all vocabulary words. 2) Use models, animations, real images from microscopes, etc to give students a visual of these structures. 3) Could investigate DNA further by extracting DNA from a strawberry or banana. 4) Utilize the micro to macro, or macro to micro when explaining the vocabulary</p>	<p>*Chromatin *Chromosomes *Chromatids *Genes *Alleles *Deoxyribonucleic Acid (DNA)</p>		
<p>8.LS.7 Recognize organisms are classified into taxonomic levels according to shared characteristics. Explain how an organism's scientific name correlates to these shared characteristics.</p>	<p>1) Create dichotomous keys to show how scientists use shared characteristics to identify organisms. 2.) Think along the lines of common ancestry</p>	<p>*Carolus Linnaeus *Taxonomy *Binomial nomenclature *Scientific name *Kingdom, Phylum, Class, Order, Family, Genus, Species</p>		
<p>8.LS.8 Explore and predict the evolutionary relationships between species looking at the anatomical differences among modern organisms and fossil organisms.</p>	<p>1) Discuss evidence supporting evolution - Carbon Dating, Fossils, Homologous structures, Embryology, Molecular Biology</p>	<p>*Adaptation *Dichotomous key *Binomial nomenclature *Phylogeny</p>		

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<p>8.LS.9 Examine traits of individuals within a species that may give them an advantage or disadvantage to survive and reproduce in stable or changing environment.</p>	<ol style="list-style-type: none"> 1) Identify several adaptations in different organisms and how they help the organism to survive and reproduce. 2) Predict how the organism might have to adapt if the environment was to change. Ex: Peppered moth 3.) Consider adaptations caused by humans that place an organism at a disadvantage (ex: tuskless elephants) 	<ul style="list-style-type: none"> *Adaptations *Traits 		
<p>8.LS.10 Gather and synthesize information about how humans alter organisms genetically through a variety of methods.</p>	<ol style="list-style-type: none"> 1) Identify types of artificial selection (cloning, hybridization, selective breeding). Provide examples of each. 2) Research/discuss the advantages and disadvantages for artificially selecting for specific traits. 3) Discuss how artificially selecting for traits in food has affected industry. 4) Argue the ethical issue of cloning human organs. 5) Discuss the ethical issue of humans selecting specific traits in their offspring. 	<ul style="list-style-type: none"> *Artificial selection *Selective breeding *Cloning *Hybridization 		

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8.LS.11 Investigate how viruses and bacteria affect the human body.	1) Explain the life cycle of viruses. 2) Discuss why it is difficult to medically treat a virus. (Discuss the AIDS virus.) 3) Research a virus discussing its life cycle, symptoms, treatment options, etc. 4) Explain the life cycle of bacteria. 5) Discuss the difference between good and bad bacteria in the human body. 6) Research a type of bacteria discussing its life cycle, symptoms, treatment options, etc.	*Viruses *Bacteria		
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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.				