8th Grade

Developing and Using Models

- Develop and/or a model to describe and predict observable and unobservable science events
- Develop a model to generate data and test ideas

What should the students know	What should the students be able to do
Chemistry ● Describe atomic particles and the differences between each ● Model how atoms bond to form compounds and molecules ● Model the effects of a chemical reaction on various substances **Earth Sciences** ● Identify rotations and revolutions of Earth and Moon ● Model the locations of the Sun, Earth, and Moon in the solar system **Genetics** ● Describe the difference between assexual and sexual reproduction **Weather/Climate** ● Model Earth's position in relation to the Sun **Physics** ● Model Newton's Laws ● Model forces acting on a moving object	**Chemistry** ● Describe how humans create materials that impact society from natural resources/elements ● Use a model to show the Law of Conservation of Mass in a chemical reaction ● Use a model that shows how temperature affects substances **Earth Sciences** ● Use a model to describe cyclic patterns of the Earth-Moon-Sun system **Genetics** ● Describe the how inherited traits are different between assexual and sexual reproduction ● Model how changes to genes may be harmful, beneficial, or neutral for an organism **Weather/Climate** ● Use a model to describe cyclic patterns of the seasons and how they affect climate ● Develop a model to describe how unequal heating and rotation of the Earth affects climate **Physics** ● Create a object or tool that can minimize forces on an object riding on a moving object through testing can achieve an optimal design

Planning and Carrying Out Investigations

- Plan an investigation individually and in groups
- Identify independent and dependent variables and controls
- Determine tools needed to gather data
- Determine what measurements will be recorded and how much data is needed to support a claim.
- Carry out an investigation producing data under a range of conditions that serves as evidence that meets the goals of the investigation.

What should the kids know	What should the students be able to do
Chemistry ● Describe atomic particles and the differences	**Chemistry** ● Show the relationships between type of matter,

between each **Earth Sciences** ● Farming pesticide and fertilizer run off into the water systems that feed into the Mississippi River affect the size of the Gulf of Mexico Deadzone ● Soil quality affects the growth of a plant **Genetics** ● Organisms display different characteristics based on inherited genes **Weather/Climate** ● Climate is changing throughout the world ● Storm intensity changes based on other weather conditions ● Changes ocean temperature during El Nino **Physics** ● Describe Newton's Laws ● Identify forces acting on a moving object	mass, energy of particles based on changes in temperature **Earth Sciences** ● Create a method of collecting data to show how large the Gulf of Mexico Deadzone grows or shrinks year to year. ● Determine other variables that could contribute to size of Gulf of Mexico Deadzone ● Show how the growth rate of a plant is affected by different types of soil based on nutrients in soil **Genetics** ● Create an investigation using the genotypes from parents on the probability of inherited traits ● Display data using a table of inherited traits of offspring **Weather/Climate** ● Plan an investigation showing how temperature is changing in various climates throughout the world ● Create a method of collecting and comparing data on storm intensity **Physics** ● Provide evidence that the sum of an object's motion depends on forces on the object and the object's mass

Obtaining, Evaluating, and Communicating Information

- Gather, read, and bring together information from multiple appropriate sources
- Assess the credibility, accuracy, and possible bias of each publication and methods used
- Describe how the information is supported or not supported by evidence

What should the students know	What should the students be able to do
Chemistry ● Describe atomic particles and the differences between each ● Identify how atoms bond to form compounds and molecules ● Explain the effects of a chemical reaction on various substances **Earth Sciences** ● Fossils provide evidence into the history of Earth ● Humans impact soil intentionally and unintentionally **Genetics** ● Explain how genotypes of an animal affect the phenotype ● Describe how genes are inherited from both the mother and the father **Weather/Climate** ● Climate change is a widely debated topic with	**Chemistry** ● Explain how synthetic materials come from natural resources/elements ● Explain how synthetic materials impact society **Earth Sciences** ● Using fossil evidence explain how the Earth's environment changed over time ● Explain how humans impact the soil quality in their area in order to meet the demands of larger companies ● Gather evidence from credible sources explaining how farming impacts more than just soil in the area **Genetics** ● Obtain information from valid sources about how humans have influence desired traits in organisms ● Explain how technology has influenced the way traits are inherited from one generation to another

human and natural causes ● Weather patterns change over time **Physics** ● Explain how car designs and safety features have changed	**Weather/Climate** ● Explain how sources are opinion vs. factual evidence in the debate between causes of climate change ● Gather evidence on changing weather patterns from valid sources and explain how other sources are biased **Physics** ● Determine fact vs opinion on the changing requirements for children in carseats ● Explain why Newton's Laws support the use of seatbelts in vehicles ● Gather evidence on the technology changes in the modern vehicle, including driverless vehicles

Engaging in Argument from Evidence

- Construct, use, and present oral and written arguments
- Support or refute the argument with research-based evidence and scientific reasoning
- Evaluate and discuss different design solutions based on its design criteria

What should the students know	What should the students be able to do
Chemistry ● How to find the masses of elements ● Explain how elements interact to form compounds **Earth Sciences** ● Various natural resources used by humans ● Methods of retrieving natural resources from the Earth ● Gravity's impact on objects on Earth **Genetics** ● Understand and explain how animals reproduce ● Understand the plant structures used in reproduction **Weather/Climate** ● Human population increases over the last century ● Changes in climate over the last century **Physics** ● Difference between mass and weight	**Chemistry** ● Explain how the masses of interacting elements can be affected by the force of gravity **Earth Sciences** ● Create an argument explaining how the increase of human population has impacted Earth's natural resources ● Create an argument explaining how the increase in human population has impacted Earth's systems **Genetics** ● Explain how animal behaviors affect the probability of successful reproduction ● Explain how plant structures affect the probability of successful reproduction **Weather/Climate** ● Create an argument supporting or refuting that the increase in human population has influenced the change in climate **Physics** ● Create an argument that gravity affects the mass of an object

	● Evaluate and explain how different design solutions to the same problem are successful based on how well they meet the criteria of the problem

Constructing Explanations and Designing Solutions

- Undertake a design project to construct and/or implement a solution that meets specific design criteria
- Apply scientific ideas to explain real-world phenomena, examples, or events
- Apply scientific ideas or principles to design, construct, and test an object, tool, process or system.
- Construct an explanation that includes data showing relationships between variables that predict phenomena.
- Construct a scientific explanation based on evidence obtained from multiple sources, scientific theories, and laws

What should the students know	What should the students be able to do
Chemistry ● How matter changes based on the environment **Earth Sciences** ● Plant and animal remains are preserved in the form of fossils ● Fossil evidence helps determine the age of the rock around the fossil ● Many different layers of rock exist **Genetics** ● Organisms inherit traits from both parents ● Organisms have to possibility of inheriting several different traits from both parents **Weather/Climate** ● Human impact on climate changes ● Changes in climate of the last century ● Humans influence on naturally occurring weather patterns **Physics** ● Forces can influence each other ● Newton's Laws of Motion	**Chemistry** ● Create a experiment that absorbs or releases heat in a chemical reaction ● Explain how matter cycles in and out of organisms **Earth Sciences** ● Explain the anatomical similarities and differences between fossils and modern organisms ● Using rock strata, explain how the geologic time scale explains Earth's history **Genetics** ● Explain how different genetic traits in a population increase some individual's probability of surviving in a specific environment ● Explain how environmental and genetic factors influence growth of an organism **Weather/Climate** ● Create a way to minimize human impact on the environment ● Create a way to monitor human impact on the environment **Physics** ● Create a way to minimize colliding forces on objects

Analyzing and Interpreting Data

- Analyze and interpret data to provide evidence to explain events
- Analyze and interpret data to determine similarities and differences
- Construct and interpret graphs of data to identify relationships.

- Analyze displays of data to identify relationships

What should the students know	What should the students be able to do
Chemistry ● Chemical reactions are affected by temperature ● Elements in the same group have similar rates of reaction **Earth Sciences** ● Pangaea was a supercontinent hundreds of millions of years ago ● Plant and animal remains are preserved in the form of fossils ● Natural disasters occur on land as well as in the water **Genetics** ● Plants can carry genetic traits that look similar to other plants ● Animals can carry genetic traits that look similar to other animals **Weather/Climate** ● El Nino affects the temperature and weather patterns across the US ● El Nino ocean current temperatures vary during different El Nino years **Physics** ● The mass of an object affects the object's motions ● Speed can increase or decrease depending on energy of an object	**Chemistry** ● Interpret graphs of how changes in temperature affect the speed of the chemical reaction ● Compare how the speed of a reaction with elements in similar groups change with changes in temperature **Earth Sciences** ● Analyze fossil patterns, continent shapes, and seafloor structure to provide evidence of plate motion ● Interpret data patterns of fossils showing how life forms have changed throughout the history of the Earth ● Using data on past natural disasters, analyze how new technologies can help minimize effects of future disasters **Genetics** ● Compare pictures of genetic traits across multiple species to identify relationships between the species **Weather/Climate** ● Analyze data from various El Nino years and determine the strength of the El Nino ● Create a graph displaying El Nino current temperatures compared to midwest winter temperatures or amount of rainfall **Physics** ● Create graphs to describe the energy relationship between the mass and speed of an object

Asking Questions and Defining Problems

- Ask questions to identify and clarify evidence of an argument.
- Ask questions and form a hypothesis that can be investigated within the scope of the classroom, outdoor environment, and public resources
- Define a design problem that includes multiple criteria
- Solve a design problem through the development of an object, tool, process or system

What should the students know	What should the students be able to do
Chemistry ● Elements combine together to form both beneficial and toxic substances to humans and other organisms ● Everything is created from elements in the	**Chemistry** ● Students will be able to define why options of changing the chemical formula of various substances may not be the best possible solution ● Students will be able to explain how scientists

periodic table **Earth Sciences** ● Waterways throughout the US are polluted due to natural and human causes **Genetics** ● Organisms inherit half of their chromosomes from their mom and the other half from their dad ● Chromosomes can be mutated naturally or due to human and environmental manipulation **Weather/Climate** ● Earth's position in relation to the sun ● Climate changes over the last century ● Naturally occurring disasters both on land and in the water over the last century ● Human impact on the environment **Physics** ● Newton's Laws of Motion	have overcome problems and created elements that last for a fraction of a seconds **Earth Sciences** ● Students will be able to define what is causing the Gulf of Mexico Deadzone ● Students will be able to design possible solutions to farming practices that cause problems in other parts of the US **Genetics** ● Students will be able to explain how genetic abnormalities affect and organism ● Students will be able to question factors that affect the genetic make up of an organism **Weather/Climate** ● Develop questions to help explain what has caused the rise in global temperature over the last century **Physics** ● Define constraints of a problem using scientific principles, impacts on people, and impacts on the natural environment

Using Mathematics and Computational Thinking

- Use mathematical representations to support scientific conclusions and design solutions

What should the students know	What should the students be able to do
Chemistry ● Model how atoms bond to form compounds and molecules ● Model the effects of a chemical reaction on various substances **Earth Sciences** ● Plant and animal remains are preserved in the form of fossils ● Fossil evidence helps determine the age of the rock around the fossil **Genetics** ● Organisms inherit traits from both parents ● Organisms have to possibility of inheriting several different traits from both parents **Weather/Climate** ● Weather patterns and temperature change based on relation to the equator **Physics** ● The amount of force on an object depends on acceleration and mass	**Chemistry** ● Students will be able to use the distributive property to balance chemical equations **Earth Sciences** ● Students will be able to illustrate the changes in a population based on fossil evidence **Genetics** ● Students will be able to show the change in population of specific species over time ● Students will be able to show the probability of specific traits inherited from parent to offspring **Weather/Climate** ● Students will be able to calculate rate of change in temperature based on yearly seasonal data ● Students will be able to predict future changes based on historical weather patterns **Physics** ● Students will be able to calculate the amount of force acting on an object ● Students will be able to manipulate mass and acceleration to predict changes in force