Glenwood Community Schools

6-12 Science Curriculum Mission Statement

Our mission is to engage all students in a challenging, sequential, and differentiated science curriculum that will develop critical thinkers, problem solvers, and effective communicators.

We believe that all students should have access to a high-quality science education that provides them with the skills and knowledge they need to be well informed citizens, to be prepared for college and careers, and to understand and appreciate the scientific world.

A special thank you to the following individuals for their hard work and dedication who have served on the District 6-12 Science Subject Area.

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NGSS Three Dimensional Learning	
Dimension	**Categories/Classifications**
8 Practices	• Asking Questions and DefiningProblems • Developing and Using Models • Planning and Carrying Out Investigations • Analyzing and Interpreting Data • Using Mathematics, Information and Computer Technology, and Computational Thinking • Constructing Explanations and Designing Solution • Engaging in Argument From Evidence • Obtaining, Evaluating, and Communicating Information
7 Cross-cutting Concepts	• Patterns, Similarity, and Diversity • Cause and Effect • Scale, Proportion, and Quantity • Systems and System Models • Energy and Matter • Structure and Function • Stability and Change
4 Disciplinary Core Ideas	• Physical Sciences • Life Sciences • Earth and Space Sciences • Engineering, Technology, and Application

Glenwood Community Middle School
6th Grade Science Curriculum

Course Purpose: Sixth grade science is an inquiry-based course that builds students' understanding of the structure of matter and its interactions, the dynamic nature of Earth's systems, the interrelationship of Earth and human activity, and the internal and external structures and processes of organisms.

Course Outcomes	Outcome Components	Description
SCI.6.1 MSPS-1	**The student will model the structure of matter and its interactions.**	
	SCI.6.1.1 MSPS-1-1	Develop models to describe the atomic composition of simple molecules and extended structures.
	SCI.6.1.2 MSPS-1-2	Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.
	SCI.6.1.3 MSPS-1-4	Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.
	SCI.6.1.4 MSPS-1-5	Develop and use a model to describe how the total number of atoms does not change ina chemical reaction and thus mass is conserved.
	SCI.6.1.5 MSPS-1-6	Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.
SCI.6.2 MS-ESS-2	**The student will analyze and interpret data to model the dynamic nature of Earth's systems.**	
	SCI.6.2.1 MS-ESS-2-1	Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.
	SCI.6.2.2 MS-ESS-2-2	Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.
	SCI.6.2.3 MS-ESS-2-3	Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.
SCI.6.3 MS-ESS-3	**The student will construct a scientific explanation based on evidence to verify an interrelationship between the Earth and human activity.**	
	SCI.6.3.1 MS-ESS-3-1	Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy and groundwater resources are the result of past and current geoscience processes.
	SCI.6.3.2 MS-ESS-3-2	Analyze and interpret data on natural hazards to forecast future catastrophic event sand investigate the development of technologies to mitigate their effects.
SCI.6.4 MS-LS-1	**The student will model internal structures and processes of organisms.**	
	SCI.6.4.1 MS-LS-1-1	Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.
	SCI.6.4.2 MS-LS-1-2	Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function.
	SCI.6.4.3 MS-LS-1-3	Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.
	SCI.6.4.4 MS-LS-1-8	Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.
	SCI.6.4.5 MS-LS-3-2	Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.

Glenwood Community Middle School
7th Grade Science Curriculum

Course Purpose: Seventh grade science is an inquiry-based course that builds students' understanding of motion and stability, conservation of energy, interactions of organisms and their ecosystems, inheritance and variation of traits, the internal and external structures and functions of organisms, and Earth's place in the universe.

Course Outcomes	Outcome Components	Description
SCI.7.1 MSPS2	**The student will construct and present an argument based on evidence to model the relationship of objects during motion and stability.**	
	SCI.7.1.1 MSPS2-3	Ask and answer questions about data to determine the factors that affect the strength.
	SCI.7.1.2 MSPS2-4	Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.
	SCI.7.1.3 MSPS2-5	Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.
SCI.7.2 MSPS3	**The student will construct and present an argument based on evidence to support the law of conservation of energy.**	
	SCI.7.2.1 MSPS3-2	Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system.
	SCI.7.2.2 MSPS3-4	Plan and conduct an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample.
	SCI.7.2.3 MSPS3-5	Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.
SCI.7.3 MSESS1	**The student will model Earth's Place in the Universe.**	
	SCI.7.3.1 MSESS1-1	Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.
	SCI.7.3.2 MSESS1-2	Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.
	SCI.7.3.3 MSESS1-3	Analyze and interpret data to determine scale properties of objects in the solar system.
	SCI.7.3.4 MSESS1-4	Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's history.
SCI.7.4 MSLS1	**The student will model internal and external structures and processes of organisms.**	
	SCI.7.4.1 MSLS1-4.	Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.
	SCI.7.4.2 MSLS1-5.	Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.
	SCI.7.4.3 MSLS1-6.	Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.
	SCI.7.4.4 MSLS1-7.	Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.
SCI.7.5 MSLS2	**The student will evaluate patterns of interactions among organisms and their ecosystems.**	
	SCI.7.5.1 MSLS2-1.	Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.

	SCI.7.5.2 MSLS2-2.	Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.
	SCI.7.5.3 MSLS2-3.	Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.
	SCI.7.5.4 MSLS2-4.	Construct and support the argument, "Changes to physical or biological components of an ecosystem affect populations". Support this argument with empirical evidence.
SCI.7.6 MSLS3	**The student will model Inheritance and Variation of Traits.**	
	SCI.7.6.1 MSLS3-1.	Develop a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins being made.
	SCI.7.6.2	Use a model as evidence to support the claim that chromosomal mutations may result in harmful, beneficial, or neutral effects to the structure and function of the organism.

Glenwood Community Middle School
8th Grade Science Curriculum
Approved Date – June 2018

Course Purpose: Eighth grade science is an inquiry-based course that builds student understandings of Newton's Laws, properties of light waves, natural selection, weather and climate, and how humans impact the Earth system.

Course Outcomes	Outcome Components	Description	NGSS
SCI.8.1	**The student will use evidence to defend a solution to a real world problem using Newton's Laws.**		**MS-PS2-1, MS PS2-2**
	SCI.8.1.1	Construct and interpret graphical displays of data to explain the relationship between kinetic energy, mass, and speed of an object.	MS-PS3-1
	SCI.8.1.2	Diagram and appropriately label the forces being applied to an object.	MS-PS2-2
	SCI.8.1.3	Organize data showing that the motion of an object is determined by the net forces acting on it.	MS-PS2-2
	SCI.8.1.4	Develop a claim with evidence about the change in an object's motion depends on the sum of the forces on the object and the mass of the object.	MS-PS2-2
SCI.8.2	**The student will develop and use a model to evaluate the properties of light waves.**		**MS-PS4**
	SCI.8.2.1	Use mathematical representations to describe a simple model for waves that includes how the amplitude is related to the energy of the wave.	MS-PS4-1
	SCI.8.2.2	Develop and use a model to describe how electromagnetic waves are reflected, absorbed, or transmitted, through various materials depending on the material and the frequency of the light.	MS-PS4-2
	SCI.8.2.3	Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals.	MS-PS4-3
	SCI.8.2.4	Diagram the flow of energy in and out of a system.	S-PS3.3, PS3.B
	SCI.8.2.5	Differentiate between conduction, convection, and radiation.	MS-PS3.3
SCI.8.3	**The student will develop and use a model to describe what determines regional climate and weather events.**		**MS-ESS2-4 MS-ESS2-5 MS-ESS2-6**
	SCI.8.3.1	Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.	MS-ESS2-4
	SCI.8.3.2	Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.	MS-ESS2-5
	SCI.8.3.3	Diagram the flow of thermal energy in and out of a system.	MS-PS3-3
	SCI.8.3.4	Evaluate data to support reasons for why weather can only be predicted probabilistically.	MS-ESS2-5
	SCI.8.3.5	Explain ways that oceans, latitude, altitude, and local/regional geography influence weather and climate.	MS-ESS2-6
SCI.8.4	**The student will integrate physical evidence from fossils and modern organisms to produce an explanation of the theory of biological evolution.**		**MS-LS4-1, MS-LS4-2, MS LS4-3**
	SCI.8.4.1	Use patterns in rock layers to determine what time period a fossil organism is present in the fossil record.	MS-LS4-1
	SCI.8.4.2	Analyze and interpret data to identify the emergence, extinction, or changes in anatomical structure of organisms over time.	MS-LS4-1
	SCI.8.4.3	Compare and contrast anatomical characteristics among modern and fossil organisms to determine evolutionary relationships.	MS-LS4-2
	SCI.8.4.4	Analyze data to compare patterns in the embryological development across multiple species to identify relationships not evident in fully formed anatomy.	MS-LS4-3
SCI.8.5	**The student will cite evidence to defend an argument with evidence regarding how the individual traits of a population can change over time**		**MS-LS4-4, MS LS4-6**

	SCI.8.5.1	Construct an explanation based on evidence that describes how natural selection leads to the predominance of certain traits in a population and the suppression of others.	MS-LS4-4
	SCI.8.5.2	Compare and contrast information the way humans influence the inheritance of desired traits in organisms to natural selection.	MS-LS4-5
	SCI.8.5.3	Explain the role natural selection plays in changing the distribution of traits in a population.	MS-LS4-6
	SCI.8.5.4	Use mathematical representation to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.	MS-LS4-6
SCI.8.6	**Thestudent will evaluate evidence on the impact human shave had on Earth's various ecosystems.**		**MS-ESS3, MS-LS2-2**
	SCI.8.6.1	Examine the impacts of human use of natural resources has on Earth's various ecosystems.	MS-ESS3.3
	SCI.8.6.2	Explain the chemical processes used to make a synthetic material and the various benefits and costs of using a synthetic material.	MS-PS1-3
	SCI.8.6.3	Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.	MS-ESS3-3
	SCI.8.6.4	Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.	MS-ESS3-4
	SCI.8.6.5	Write questions to clarify evidence of factors that have caused the rise in global temperatures over the past century.	MS-ESS3-5
	SCI.8.6.6	Evaluate competing design solutions for maintaining biodiversity and ecosystem services.	MS-LS2-5
	SCI.8.6.7	Evaluate competing design solutions for maintaining biodiversity and ecosystem services.	MS-LS2-5

Glenwood Community Middle School
Criminology Curriculum
Approved Date – August 2021

Course Purpose: The Criminology Course introduces students to the field of criminology, the study of crime. This course provides an overview of the three areas (including agencies and processes) involved with the criminal justice system: law enforcement, courts/legislature, and corrections. The student will look at possible explanations for crime from psychological, biological, and sociological perspectives and investigate how the criminal justice system handles criminals. The student will examine the roles and problems of the criminal justice system in a democratic society with an emphasis on Constitutional Rights implications as individuals move through the justice system (during police investigations, arrest, trial proceedings, and residents of correctional facilities).

Course Outcomes	Outcome Components	Description	CCTC (Common Career Technical Core)
SS.CRIM.01	**The student will describe constitutional impacts on the criminal justice system, critique fundamental criminology concepts, and analyze current crime data to develop claims.**		
	SS.CRIM.01.01	Identify, explain, and critique the fundamental concepts that make up the modern criminology field. (Rational Choice Theory, Strain Theory, Labeling Theory, etc)	SS-Soc.9-12.19
	SS.CRIM.01.02	Examine and summarize constitutional law and legal cases that impact on Criminal Justice System. (4th/5th/8th/14th Amendments, *Miranda v. Arizona*, etc)	
	SS.CRIM.01.03	Distinguish between the different types of crime.	
	SS.CRIM.01.04	Research crime trends in the United States, Iowa, and locally, then compare data to develop a report including interpretations of the data, consistencies, and inconsistencies. (claims and evidence)	
SS.CRIM.02	**The student will examine and evaluate law enforcement's development, procedures, and functions within the criminal justice system.**		
	SS.CRIM.02.01	Examine and explain historical factors that influenced the development of modern police forces in the United States.	
	SS.CRIM.02.02	Recognize the various levels of law enforcement (local, state and federal) and the duties for each.	LW-ENF 5.1
	SS.CRIM.02.03	Explain the moral and ethical issues that exist within law enforcement.	LW-ENF 4.2
	SS.CRIM.02.04	Evaluate how present-day issues affect law enforcement and propose a solution. (policing styles, profiling, diversity, police brutality, etc)	LW-ENF 5.6
SS.CRIM.03	**The student will examine and evaluate the court system's structure, procedures, and functions within the criminal justice system.**		
	SS.CRIM.03.01	Define the roles of courtroom participants.	
	SS.CRIM.03.02	Describe the structure and function of federal, state, and local court systems.	LW-ENF 5.5:
	SS.CRIM.03.03	Outline the criminal case process and sentencing process.	LW-COR 11.3
	SS.CRIM.03.04	Discuss the relationship between law enforcement and the court system within the context of the criminal justice system.	
	SS.CRIM.03.05	Evaluate how present-day issues affect the court systems and propose a solution. (constitutional law, sentencing, capital punishment, etc)	
SS.CRIM.04	**The student will examine and evaluate the correctional system's development, functions, and effectiveness within the criminal justice system.**		
	SS.CRIM.04.01	Summarize the history of the correctional system.	

	SS.CRIM.04.02	Compare and contrast the roles of jails/prisons.	
	SS.CRIM.04.03	Compare and contrast the roles of probation/parole.	
	SS.CRIM.04.04	Discuss the relationship between law enforcement, the court system, and corrections within the context of the criminal justice system.	
	SS.CRIM.04.05	Evaluate how present-day issues affect the correctional system and propose a solution. (parole, overcrowding, privatization, etc.)	
SS.CRIM.05	**The student will outline the development of the juvenile justice system and juvenile rights, distinguish between juvenile/adult justice systems, and address dilemmas within the juvenile justice system.**		
	SS.CRIM.05.01	Trace the development of the juvenile justice system and describe critical elements/events in its creation.	
	SS.CRIM.05.02	Outline juvenile rights.	
	SS.CRIM.05.03	Compare/contrast qualities of the juvenile justice system with the adult justice system.	
	SS.CRIM.05.04	Evaluate alternatives to juvenile incarceration.	
	SS.CRIM.05.05	Describe how present-day issues affect the juvenile justice system and propose a solution. (mental health services, interventions, legal defense, etc.)	

Glenwood Community Middle School
Middle School Astronomy - Science Curriculum
Approved Date – April 2019

Course Purpose: The student in Intro to Astronomy will investigate the formation of the stars and Universe, explore patterns to explain the Solar System and types of stars, and explain how scientists have studied astronomy overtime.

Course Outcomes	Outcome Components	Description
SCI.A.1	**The student will explain the tools, methods, and purposes of the scientific study of astronomy.**	
	SCI.A.1.1	Use examples to explain the uses of constellations and asterisms.
	SCI.A.1.2	Use evidence to describe the differences between astronomy and astrology.
	SCI.A.1.3	Do research to inform an audience about the tools used in the study of astronomy.
SCI.A.2	**The student will use various forms of data to describe the differences in planets in the solar system.**	
	SCI.A.2.1	Cite evidence to describe the formation of the solar system using the planetary nebular theory.
	SCI.A.2.2	Cite evidence to describe the inner planets.
	SCI.A.2.3	Cite evidence to describe the outer planets.
	SCI.A.2.4	Describe patterns in data to compare and contrast the inner planets to the outer planets.
SCI.A.3	**The student will use various forms of data to describe the characteristics of smaller objects found in the solar system.**	
	SCI.A.3.1	Organize data to describe the characteristics of the various moons in the solar system.
	SCI.A.3.2	Make inferences from data to describe the characteristics of the Moon.
	SCI.A.3.3	Organize scientific data to explain the differences between a dwarf planet and a planet.
	SCI.A.3.4	Use observational data to describe the various smaller solar system objects (comets, asteroids, meteors, etc.).
SCI.A.4	**The student will generate an argument that analyzes the costs and benefits of exploring other objects in the Solar System (both manned and unmanned missions).**	
	SCI.A.4.1	Create a timeline summarizing the key events in U.S. Space Exploration.
	SCI.A.4.2	Do research to create an advertisement for a piece of technology that was developed as a result of the U.S. Space Program.
	SCI.A.4.3	Organize evidence to explain the challenges of exploring another object in the Solar System.
SCI.A.5	**The student will synthesize various forms of evidence to explain how the Sun impacts Earth and the Solar System.**	
	SCI.A.5.1	Use evidence to explain the phenomenon known as the Goldilocks/Habitable Zone.
	SCI.A.5.2	Cite scientific research to explain how the Sun produces its energy.
	SCI.A.5.3	Use various forms of evidence to explain the phenomenon of solar weather and how it impacts the Earth.
SCI.A.6	**The student will use data from multiple sources to explain the different categories of stars.**	
	SCI.A.6.1	Gather data to categorize stars based upon magnitude, luminosity, temperature, and color.
	SCI.A.6.2	Use examples to describe the various categories of stars (high and low mass stars, main sequence, red giants, etc.)
	SCI.A.6.3	Use the HR Diagram and other forms of evidence to explain the lifecycle of stars.
	SCI.A.6.4	Describe the characteristics of a black hole.
SCI.A.7	**The student will cite evidence in explaining the characteristics of the Universe.**	
	SCI.A.7.1	Describe the characteristics of the Milky Way Galaxy.
	SCI.A.7.2	Compare and contrast the differences in structure between various galaxies.
	SCI.A.7.3	Explore and explain the concepts of light year and speed of light.
	SCI.A.7.4	Summarize the Big Bang Theory and the concept of universe expansion

Glenwood Community Middle School
Exercise Science/Motor Behavior Curriculum
Approved Date - October 2020

Course ID:	**Course Purpose**: The purpose of this course is to explore specific body systems and exercise programs to gain an understanding of the impact of personal exercise. The student will develop an understanding of how skills are learned as related to specific exercises acquisition; as well as be able to identify the developmental stages and evaluate the effects of aging.

Course Outcomes	Outcome Components	Description	Iowa Core
ExSci.01	**The student will explain how body systems relate to and have an impact on individual exercise.**		
	ExSci.01.01	Identify and summarize the basic function of each body system.	
	ExSci.01.02	Differentiate between the body systems and their individual impact on physical exercise.	
	ExSci.01.03	Compare/contrast how specific body systems affect individual exercise.	
ExSci.02	**The student will compare and contrast energy systems used within a variety of exercise programs.**		
	ExSci.02.01	Identify the 3 different types of energy systems as it pertains to developing an exercise program.	
	ExSci.02.02	Create a specific exercise program that addresses both types of anaerobic activity.	
	ExSci.02.03	Create a specific exercise program that addresses aerobic energy.	
ExSci.03	**The student will explain skill acquisition and how new skills are obtained and how age impacts overall development.**		
	ExSci.03.01	Examine the process of skill acquisition of a new skill.	
	ExSci.03.02	Illustrate the phases of acquiring a specific new physical skill.	
	ExSci.03.03	Identify the effects of individual stages (birth to old age) on motor behavior and exercise.	
	ExSci.03.04	Identify the effects of a particular stage on individual exercise and motor skills.	
ExSci.04	**The student will analyze motor skills and movement patterns and connect the knowledge to exercise or sport.**		
	ExSci.04.01	Identify and summarize gross motor skills and movement patterns.	
	ExSci.04.02	Identify and summarize fine motor skills and movement patterns.	
	ExSci.04.03	Demonstrate gross and fine motor skills to a specific exercise or sport.	

Glenwood Community High School
Medical Detectives (PLTW) Curriculum
Approved Date - October 2020

my.PLTW.org	**Course Purpose:** The student will play the role of real-life medical detectives as they collect and analyze medical data to diagnose disease. They solve medical mysteries through hands-on projects and labs, measure and interpret vital signs, dissect a sheep brain, investigate disease outbreaks, and explore how a breakdown within the human body can lead to dysfunction.

Course Outcomes	Outcome Components	Description	State/Natl Standard Reference
MD1	**The student will analyze medical data to diagnose a patient with a mystery illness.**		NGSS Sci & Eng P1,P3,P4,P6-P8 NHSS 1.32
	MD1.01	Interpret qualitative and quantitative data through observation, controlled experiments, literature searches, and/or patient interviews.	
	MD1.02	Interpret qualitative and quantitative patient data through the identifying of trends, patterns, relationships in data to lead to diagnosis.	
	MD1.03	Analyze with diagrams, charts, graphs or tables data that illustrate trends in vital signs.	
	MD1.04	Construct and communicate arguments from empirical evidence to determine course of action for healthcare needs and/or validate results of diagnosis.	
MD2	**The student will model and communicate about the structure, function, and malfunction of an organ system.**		**NGSS Sci & Eng P1,P2-P4,P6-P8 MS-LS1-3 MS-LS1-5 MS-LS1-8 NHSS 1.13**
	MD2.01	List evidence to support an argument on how the body is a system of subsystems composed of groups of cells.	
	MD2.02	Identify basic structures, functions, and organization of body system(s).	
	MD2.03	Design a model(s) to communicate the structure and function of an organ system.	
	MD2.04	Analyze and/or interpret data to diagnose malfunctions of a system by gathering appropriate data.	
MD3	**The student will explain the location and source of a toxin causing an outbreak in the community by using a scientific argument.**		**NGSS Sci & Eng P1,P3-P8 MS-LS1-8 NHSS 1.32**
	MD3.01	Interpret qualitative and quantitative data through the use of research, interviews, maps, diagrams, charts, graphs or tables (searching for trends, patterns, relationships in data).	
	MD3.02	Summarize the various sources of outbreaks.	
	MD3.03	Identify claims supported by evidence to form conclusions.	

Glenwood Community High School
Physical Science (Grade 9th) Curriculum
Adjustment Date December 2021

Course Purpose: PS is an inquiry-based laboratory science course which consists of chemistry, physics, and earth science principles. PS will utilize direct instruction, labs, activities, projects, and group work. Writing and technology use are major components of course structure. This course will also focus on exploring the relationships between science, mathematics, engineering, and technology.

Course Outcomes	Outcome Components	Description
PS.9.1 HS-PS1	**The student will analyze data to predict the properties, structure, and interaction of matter.**	
	PS.9.1.1 HS-PS1-1	Use data from the periodic table to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.
	PS.9.1.2 HS-PS1-2	Analyze data to construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.
	PS.9.1.3 HS-PS1-3	Plan and conduct an investigation to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.
PS.9.2 HS-PS1	**Students will analyze models that demonstrate the law of conservation to describe changes in chemical reactions.**	
	PS.9.2.1 HS-PS1-4	Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.
	PS.9.2.2 HS-PS1-5	Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.
	PS.9.2.3 HS-PS1-6	Refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium.
	PS.9.2.4 HS-PS1-7	Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.
PS.9.3 HS-PS3	**The student will develop a model to explain how energy is transferred between objects and conserved within interacting objects.**	
	PS.9.3.1 HS-PS3-2	Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motion of particles (objects) and energy associated with the relative positions of particles (objects).
	PS.9.3.2 HS-PS3-4	Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).
	PS.9.3.3 HS-PS3-2	Calculate the amount of energy, mass, heat capacity, or temperature change a substance has while it releases or absorbs energy.
	PS.9.3.4 HS-PS3-3	Predict how the energy, mass, or change in temperature will be affected when one of the aforementioned variables is changed.
PS.9.4 HS-PS2	**The student will analyze the movement of an object to identify the forces acting on that object.**	
	PS.9.4.1 HS-PS2-1	Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.
	PS.9.4.2 HS-PS2-2	Use mathematical representations to support the claim that the total momentum of a system is conserved when there is no net force on the system.
	PS.9.4.3 HS-PS2-3	Apply scientific and engineering ideas to design, analyze, and refine a device that minimizes the force on a macroscopic object during a collision.

	PS.9.4.4 HS-PS2-4	Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects.
PS.9.5 HS-PS3	**The student will analyze data to explain how energy is transferred to show the law of conservation of energy.**	
	PS.9.5.1 HS-PS3-1	Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.
	PS.9.5.2 HS-PS3-2	Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motion of particles (objects) and energy associated with the relative positions of particles (objects).
	PS.9.5.3 HS-PS3-3	Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.
	PS.9.5.4 HS-PS3-5	Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction.
	PS.9.5.5 HS-PS2-5	Plan and conduct an investigation to provide evidence that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current.
PS.9.6 HS-PS4	**The student will analyze evidence to describe how waves can transfer energy and store information.**	
	PS.9.6.1 HS-PS4-1	Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.
	PS.9.6.2 HS-PS4-2	Analyze claims about the advantages of using a digital transmission and storage of information to describe modern technological advances.
	PS.9.6.3 HS-PS4-3	Analyze the claims, evidence, and the reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other.
	PS.9.6.4 HS-PS4-4	Analyze the validity and reliability of claims in published materials to discuss the claim that different frequencies of electromagnetic radiation have when absorbed by matter.
PS.9.7 **HS-ESS3**	**Students will use models to describe the formation and function of the Earth, solar system, and universe.**	
	PS.9.7.1 HS-ES1-1	Develop a model based on evidence to illustrate the life span of the sun and the role of nuclear fusion in the sun's core to release energy that eventually reaches Earth in the form of radiation.
	PS.9.7.2 HS-ES1-2	Construct an explanation of the Big Bang theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe.
	PS.9.7.3 HS-PS1-8	Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay.
	PS.9.7.4 HS-ES1-3	Communicate scientific ideas about the way starts, over their life cycle, produce elements.
	PS.9.7.5 HS-ES1-6	Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of the Earth's formation and early history.
	PS.9.7.6 HS-ES1-4	Use mathematical or computational representation to predict the motion of orbiting objects in the solar system.
PS.9.8	**Students will analyze data about Earth's systems to explain geological forms.**	
	PS.9.8.1 HS-ESS2-1	Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features.
	PS.9.8.2 HS-ESS2-2	Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems.
	PS.9.8.3	Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.

	HS-ESS2-4	
	PS.9.8.4 HS-ESS2-3	Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection.
	PS.9.8.5 HS-ESS2-5	Plan and conduct and investigation of the properties of water and its effect on Earth materials and surface processes.
	PS.9.8.6 HS-ES1-5	Analyze evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks.
PS.9.9	**The student will analyze data and solutions to determine the effects of human activities on Earth's systems.**	
	PS.9.9.1 HS-ESS3-1	Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.
	PS.9.9.2 HS-ESS3-5	Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts on Earth's systems.
	PS.9.9.3 HS-ESS3-6	Use a computational representation to illustrate the relationships among Earth's systems and how those relationships are being modified due to human activity.
	PS.9.9.4 HS-ESS3-4	Analyze or refine a technological solution that reduces impacts of human activities on natural systems.
PS.9.10 **HS-ETS1**	**The student will utilize the engineering design process to develop solutions to everyday chemical issues.**	
	PS.9.10.1 HS-ESS3-2	Analyze competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.
	PS.9.10.2 HS-ETS1-1	Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
	PS.9.10.3 HS-ETS1-2	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
	PS.9.10.4 HS-ETS1-3	Analyze a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.
	PS.9.10.5 HS-ETS1-4	Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.
	PS.9.10.6 HS-PS2-6	Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.
PS.9.11	**Students will support phenomena and essential questions using science and engineering practices discussed in the disciplinary core ideas.**	
	PS.9.11.1 HS-SEP-1	Ask and refine questions that lead to descriptions and explanations of how the natural and designed world works.
	PS.9.11.2 HS-SEP-2	Develop models as tools to represent ideas and scientific explanations.
	PS.9.11.3 HS-SEP-3	Plan and conduct investigations with clearly defined variables and parameters.
	PS.9.11.4 HS-SEP-4	Analyze data to derive the meaning and search for patterns in the data.
	PS.9.11.5 HS-SEP-5	Apply mathematics and computational thinking to solve equations and recognize qualitative relationships.
	PS.9.11.6 HS-SEP-6	Use empirical evidence to construct explanations.
	PS.9.11.7 HS-SEP-7	Design a solution to a given problem using the engineering process.
	PS.9.11.8 HS-SEP-6	Present information that has been independently obtained and evaluated to communicate explanations or solutions.

PS.9.12	**Students will utilize multiple intellectual tools that are related across the differing areas of disciplinary content to enrich their application of practices and their understanding of core ideas.**	
	PS.9.12.1 HS-CC-1	Identify patterns to apply relationships and their underlying causes.
	PS.9.12.2 HS-CC-2	Use the cause and effect mechanism that connects two or more systems.
	PS.9.12.3 HS-CC-3	Estimate scale, proportion, and quantity when investigating phenomena.
	PS.9.12.4 HS-CC-4	Analyze system models to understand and predict the relationship of the components of the system.
	PS.9.12.5 HS-CC-5	Calculate the energy flow into, out of, and within systems to understand the systems behavior.
	PS.9.12.6 HS-CC-6	Correlate the function of materials to the structures and properties of the materials.
	PS.9.12.7 HS-CC-7	Evaluate conditions that affect stability and rate of change in natural and designed systems.

Glenwood Community High School
Physical Science-Physics (PSP) Curriculum (Grade: 9)

Course Purpose: PSP is an inquiry-based laboratory science course which consists of physics and earth science principles. PSP will utilize direct instruction, labs, activities, projects, and group work. Writing and technology use are major components of course structure. This course will also focus on exploring the relationships between science, mathematics, engineering, and technology.

Course Outcomes	Outcome Components	Description
PSP.9.1 HS-PS2	**The student will analyze the movement of an object to identify the forces acting on that object.**	
	PSP.9.1.1 HS-PS2-1	Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.
	PSP.9.1.2 HS-PS2-2	Use mathematical representations to support the claim that the total momentum of a system is conserved when there is no net force on the system.
	PSP.9.1.3 HS-PS2-3	Apply scientific and engineering ideas to design, analyze, and refine a device that minimizes the force on a macroscopic object during a collision.
	PSP.9.1.4 HS-PS2-4	Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects.
	PSP.9.1.5 HS-PS2-5	Plan and conduct an investigation to provide evidence that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current.
PSP.9.2 HS-PS3	**The student will analyze data to explain how energy is transferred to show the law of conservation of energy.**	
	PSP.9.2.1 HS-PS3-1	Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.
	PSP.9.2.2 HS-PS3-2	Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative positions of particles (objects).
	PSP.9.2.3 HS-PS3-3	Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.
	PSP.9.2.4 HS-PS3-5	Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction.
PSP.9.3 HS-PS4	**The student will analyze evidence to describe how waves can transfer energy and store information.**	
	PSP.9.3.1 HS-PS4-1	Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.
	PSP.9.3.2 HS-PS4-2	Analyze claims about the advantages of using a digital transmission and storage of information to describe modern technological advances.
	PSP.9.3.3 HS-PS4-3	Analyze the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other.
	PSP.9.3.4 HS-PS4-4	Analyze the validity and reliability of claims in published materials to discuss the claim that different frequencies of electromagnetic radiation have absorbed by when matter.
	PSP.9.3.5 HS-PS4-5	Communicate technical information about how some technological devices use the principles of wave behavior and interactions with matter to transmit and capture information and energy.
PSP.9.4 HS-ESS2	**The student will analyze data about Earth's systems to explain geological forms.**	

	PSP.9.4.1 HS-ESS2-1	Develop a model to illustrate how Earth's internal and surface processes operate different spatial and temporal scales to form continental and ocean-floor features.
	PSP.9.4.2 HS-ESS2-2	Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems.
	PSP.9.4.3 HS-ESS2-4	Use a model to describe how variations in the flow of energy into and out of Earth' systems result in changes in climate.
	PSC.9.4.4 HS-ESS2-3	Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection.
	PSC.9.4.5 HS-ESS2-5	Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.
	PSP.9.4.6 HS-ES1-5	Analyze evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks.
PSP.9.5 HS-ETS1	**The student will analyze a solution using the engineering design process to develop solutions to a real-world physical science issue.**	
	PSP.9.5.1 HS-ETS1-1	Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
	PSP.9.5.2 HS-ETS1-2	Develop a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
	PSP.9.5.3 HS-ETS1-3	Analyze a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.
	PSP.9.5.4 HS-ETS1-4	Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

Glenwood Community High School
Biology Curriculum (Grade: 10)
Approved Date – May 2021

Course Purpose: Biology is an inquiry-based laboratory course that explores elements of life science. Through experiments, explorations, investigations, presentations, and projects the student will learn essential concepts of life science. As a result of this course, the student will be able to apply critical thinking skills to everyday science phenomena, explain and demonstrate their thinking, and gain increased responsibility for their learning. The performance expectations for Biology blends core ideas with scientific and engineering practices and crosscutting concepts to support the student in developing usable knowledge that can be applied across the science disciplines.

Course Outcomes	Outcome Components	Description	Iowa Core Science Standards (NGSS)
BIO.10.1	**Ecology: Trophic Levels and Energy Levels** **The student will analyze similarities and differences in how energy and matter cycle through an organism.**		
	BIO.10.1.1	Identify and distinguish producers, consumers, and decomposers from a provided food web.	HS-LS2-4 HS-LS2-5 HS-ETS1-2
	BIO.10.1.2	Explain the pathway of energy transfer through trophic levels and the reduction of available energy at successive trophic levels.	
	BIO.10.1.3	Analyze to describe and explain the movement of matter and energy through the different biogeochemical cycles, including water and carbon.	
BIO.10.2	**Ecology: Populations** **The student will apply and show reasoning to explain how and why organisms interact with their ecosystems.**		
	BIO.10.2.1	Analyze data to explain how population size is determined by births, deaths, immigration, emigration, and limiting factors (biotic and abiotic) that determine carrying capacity.	HS-LS2-1 HS-LS2-2 HS-LS2-6 HS-ETS1-1
	BIO.10.2.2	Identify sources of information and assess their reliability according to the strict standards of scientific investigation.	
	BIO.10.2.3	Explain the consequences of the losses of biodiversity due to catastrophic events, climate changes, human activity, and the introduction of invasive, non-native species.	
BIO.10.3	**Ecology: Human Impact** **The student will apply the engineering design process to create and analyze solutions to real-world biological problems.**		
	BIO.10.3.1	Predict the impact of individuals on environmental systems, and examine how human lifestyles affect sustainability.	HS-LS2-7 HS-LS4-6 HS-ETS1-3
	BIO.10.3.2	Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests.	
	BIO.10.3.3	Discuss the need for adequate monitoring of environmental parameters when making policy decisions.	

	BIO.10.3.4	Identify that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.	
BIO.10.4	**Building Blocks of Life** **The student will analyze information and explain how macromolecules are the basic building blocks of all organisms.**		
	BIO.10.4.1	Identify and describe the basic molecular structure of carbohydrates, lipids, proteins, and nucleic acids.	HS-LS1-1 HS-LS1-2 HS-LS1-6 HS-LS1-7
	BIO.10.4.2	Describe the primary functions of carbohydrates, lipids, proteins, and/or nucleic acids in organisms.	
	BIO.10.4.3	Explain how enzymes speed up the rate of a biochemical reaction by lowering the reaction's activation energy.	
	BIO.10.4.4	Identify and describe the effect of environmental factors on enzyme activity.	
	BIO.10.4.5	Explain the properties of water including polarity, density, adhesion/cohesion, heat capacity, and solvency.	
	BIO.10.4.6	Explain how its properties make water essential for life on Earth.	
BIO 10.5	**Cells: Structure and Function** **The student will examine and explain how an organism's structure and function help it survive.**		
	BIO.10.5.1	Explain the cell theory.	HS-LS1-3
	BIO.10.5.2	Recognize how the contributions of scientists such as Van Leeuwenhoek, Hooke, Schwann, Schleiden, and Virchow aided in the development of Cell Theory (but will not assess what each scientist contributed).	
	BIO.10.5.3	Compare and contrast the structures found in plant and animal cells.	
	BIO.10.5.4	Explain the role of cell membranes as a highly selective barrier (passive and active transport)	
	BIO.10.5.5	Describe how structures in cells are directly related to their function in the cell.	
	BIO.10.5.6	Compare and contrast the structure found in prokaryotic and eukaryotic cells.	
BIO 10.6	**Cellular Energy** **The student will analyze diagrams of cells to explain how different types of cells use and convert energy.**		
	BIO.10.6.1	Identify the reactants, products, and basic functions of photosynthesis.	HS-LS1-5 HS-LS1-7 HS-LS2-3 HS-ETS1-2
	BIO.10.6.2	Identify the reactants, products, and basic functions of aerobic and anaerobic cellular respiration.	
	BIO.10.6.3	Explain how photosynthesis and cellular respiration are connected and how the reactants of one are the products of the other.	
	BIO.10.6.4	Explain the role of adenosine triphosphate (ATP) in energy transfers within a cell.	

BIO 10.7	**Cell Cycle/Mitosis/Meiosis** **The student will analyze plant and animal cells and explain the life cycle of each type of cell.**		
	BIO.10.7.1	Describe specific events occurring in each of the stages of the cell cycle and/or phases of mitosis, including cytokinesis.	HS-LS1-4
	BIO.10.7.2	Explain how mitosis forms new cells and its role in maintaining chromosome number during asexual reproduction.	
	BIO.10.7.3	Describe the role of mitosis in asexual reproduction.	
	BIO.10.7.4	Differentiate the processes of mitosis and meiosis.	
	BIO.10.7.5	Describe the process of meiosis, including independent assortment and crossing over.	
	BIO.10.7.6	Explain how meiosis results in the formation of haploid gametes or spores.	
BIO 10.8	**DNA, RNA, Replication, Protein Synthesis** **The student will critique and explain different DNA structures and functions.**		
	BIO.10.8.1	Complete a DNA strand with its complementary pairs.	HS-LS3-1
	BIO.10.8.2	Describe the process of DNA replication and its role in the transmission and conservation of genetic information.	
	BIO.10.8.3	Explain how similarities in the genetic codes of organisms are due to common ancestry and the process of inheritance.	
	BIO.10.8.4	Explain why the genetic code (mRNA codon chart) is common to almost all organisms.	
	BIO.10.8.5	Explain how mutations in the DNA sequence may or may not result in phenotypic change. Explain how mutations in gametes may result in phenotypic changes in offspring.	
	BIO.10.8.6	Explain the basic processes of transcription and translation and how they result in the expression of genes.	
BIO 10.9	**Genetics and Heredity** **The student will analyze evidence and data to develop an explanation of inheritance.**		
	BIO.10.9.1	Analyze patterns of inheritance by utilizing Mendel's laws of segregation and independent assortment.	HS-LS3-2 HS-LS3-3
	BIO.10.9.2	Identify, analyze, and predict inheritance patterns caused by various modes of inheritance.	
	BIO.10.9.3	Discuss observed inheritance patterns caused by various modes of inheritance, including dominant, recessive, codominant, sex-linked, polygenic, and multiple alleles.	
	BIO.10.9.4	Express inheritance outcomes in percent, ratios, or fractions.	
BIO 10.10	**Theory of Evolution** **The student will analyze evidence to draw conclusions of biological evolution.**		
	BIO.10.10.1	Explain how the scientific theory of evolution is supported by the fossil	HS-LS2-8

		record, comparative anatomy, comparative embryology, biogeography, molecular biology, and observed evolutionary change.	HS-LS4-1 HS-LS4-2 HS-LS4-3 HS-LS4-4
	BIO.10.10.2	Describe the conditions required for natural selection, including overproduction of offspring, inherited variation, and the struggle to survive, which result in differential reproductive success.	
	BIO.10.10.3	Discuss mechanisms of evolutionary change other than natural selection such as genetic drift and gene flow.	
BIO 10.11	**Human Evolution** **The student will analyze evidence to draw conclusions of human evolution.**		
	BIO.10.11.1	Describe scientific explanations of the origin of life on Earth.	HS-LS4-5 HS-LS4-6
	BIO.10.11.2	Identify situations or conditions contributing to the origin of life on Earth.	
	BIO.10.11.3	Identify basic trends in hominid evolution from early ancestors six million years ago to modern humans, including brain size, jaw size, language, and manufacture of tools as they relate to change in the skull or brain size.	

Glenwood Community High School
11th Grade Environmental Science Curriculum
Approved Date – January 2019

Course Purpose: Environmental Science is a multidisciplinary science class designed to show connections between biology, chemistry, and physics as these fields of scientific inquiry pertain to the environment. As result of this course, the student will have a coherent and realistic picture of the applications of a variety of scientific concepts as they manifest in our environment. The purpose of this course is to increase the student knowledge of environmental challenges faced today and to allow for the student to apply critical thinking skills.

Course Outcomes	Outcome Components	Description
HS.ES.1	**The student will utilize the necessary scientific skills to identify and analyze environmental issues.**	
	HS.ES.1.1	Explain with example that science is both an organized and methodical way of studying the natural world and a collected knowledge gained from such studies.
	HS.ES.1.2	Explain science as a process that involves making observations, asking questions, developing hypotheses, making and testing predictions, and analyzing results; provide example of how this process can happen in no particular order.
	HS.ES.1.3	Define and provide example of environmental science as an interdisciplinary science; relate these disciplines to common environmental issues.
	HS.ES.1.4	Identify and discuss values and beliefs inherent in environmental decision-making.
HS.ES.2	**The Earth's Spheres** **The student will Investigate the relationship between the geosphere, atmosphere, and hydrosphere; formulate and justify a logical explanation of their relationship.**	
	HS.ES.2.1	Identify and describe the structure and function of the Earth's Layers: Crust, Mantle, and Core.
	HS.ES.2.2	Explain and diagram plate tectonics, including tectonic plates and the interactions at plate boundaries.
	HS.ES.2.3	Diagram the layers of the atmosphere and explain how the atmosphere protects the Earth.
	HS.ES.2.4	List the major components of the atmosphere, and function of each component.
HS.ES.3	**The student will analyze how matter and energy move through the biosphere and construct a comprehensive model of the process.**	
	HS.ES.3.1	Identify the components of the biosphere; illustrate and explain the interrelationships within the components.
	HS.ES.3.2	Explain biogeochemical cycles as a process by which matter and energy cycle between living systems and the physical environment; justify explanation with example.
	HS.ES.3.3	List major components of the hydrosphere, and function of each component.
HS.ES.4	**Interdependence of Organisms (Ecology)** **The student will describe the structure of an ecosystem and develop a logical explanation of the changes that occur within an ecosystem, including the drivers of the change (natural and human-induced factors).**	
	HS.ES.4.1	Distinguish between the biotic and abiotic factors in an ecosystem.
	HS.ES.4.2	Define and explain the interrelationships) between: individual, population, community, ecosystem, and biosphere.
	HS.ES.4.3	Analyze ecosystem to describe an organism's habitat.
	HS.ES.4.4	Define a species' niche through explanation of the interactions between a species and its environment.
	HS.ES.4.5	Provide example to discriminate between a species and a population, and between a community and an ecosystem.
	HS.ES.4.6	Explain how organisms have adapted to their environments, using examples of the diversity of living things.
HS.ES.5	**The student will analyze trends in population growth in order to measure the effect on the environment.**	
	HS.ES.5.1	Identify and describe the factors that contribute to or limit the growth of a population.
	HS.ES.5.2	Analyze population trends to identify and describe factors that affect population density and distribution.

	HS.ES.5.3	Diagram the three phases of an exponential growth curve (resulting in a Logistic Growth curve) and indicate carrying capacity.
HS.ES.6	**Ecological Communities - the flow of energy and nutrients through a community. The student will illustrate and explain the interrelationships within a food chain and a food web.**	
	HS.ES.6.1	Distinguish and provide example to illustrate the difference between consumers and producers.
	HS.ES.6.2	Analyze food chains and food webs to trace and describe the flow of energy in a food chain.
	HS.ES.6.3	Identify and describe the different trophic levels in a food pyramid.
	HS.ES.6.4	Explain the term "biomass" and its relationship to a food pyramid.
	HS.ES.6.5	Explain - and justify with example - the relationship between diversity and stability in an ecosystem.
	HS.ES.6.6	Describe and support with example of the major types of interactions between species (e.g., competition, predation, symbiotic relationships).
HS.ES.7	**Community Stability The student will analyze to describe how communities respond to a disturbance in the system, including the drivers of the change (natural and human-induced factors).**	
	HS.ES.7.1	Define the concept of ecological succession; justify with one or more illustrative examples.
	HS.ES.7.2	Compare and contrast primary and secondary succession; describe and defend one or more examples of each.
	HS.ES.7.3	Define and provide example of a Climax Community within the context of ecological succession.
	HS.ES.7.4	Define and provide multiple examples of invasive species.
	HS.ES.7.5	Explain and illustrate with example how an invasive species affects a community.
HS.ES.8	**The student will identify and describe the major biomes.**	
	HS.ES.8.1	Identify and provide examples of a terrestrial biome.
	HS.ES.8.2	Identify and describe the characteristics of the major terrestrial biomes.
	HS.ES.8.3	Analyze climatograms to identify major terrestrial biomes.
	HS.ES.8.4	Describe an aquatic ecosystem in terms of salinity, depth, flowing or non-flowing water.
	HS.ES.8.5	Explain, justify, and defend the ecological importance of wetlands.
HS.ES.9	**The student will demonstrate the ability to identify trends in human population growth.**	
	HS.ES.9.1	Explain and provide example of how technological advancements have changed the ways people and increased population size.
	HS.ES.9.2	Describe and explain the factors that affect the growth of the human population.
	HS.ES.9.3	Construct age pyramids for an underdeveloped and developed country; analyze population trends to explain the differences.
	HS.ES.9.4	Explain and provide example(s) of how demographic transition effects a population.
	HS.ES.9.5	Analyze problems associated with rapid human population growth; develop and defend an illustrative example of one or more problems.
	HS.ES.9.6	Analyze to evaluate strategies that countries have used or may use to reduce population growth.
HS.ES.10	**Air, Water and Land Resources Conservation The student will identify and explain the effect and impact of human influences on the atmosphere.**	
	HS.ES.10.1	Compare and contrast naturally occurring and man-made sources of major air pollutants.
	HS.ES.10.2	Define acid deposition, identify sources, and provide illustrative example.
	HS.ES.10.3	Identify types of greenhouse gases and their sources.
	HS.ES.10.4	Compare and contrast the effects of acid deposition, ozone depletion, and global warming on living and nonliving environments.
HS.ES.11	**The student will identify and explain the effect and impact of human influences on water supply.**	
	HS.ES.11.1	Construct a model of the water cycle from land (include groundwater) to sea, to atmosphere, etc.
	HS.ES.11.2	Explain how water is considered both a renewable and a limited resource; provide illustrative example(s) to defend explanation.
	HS.ES.11.3	Analyze how water is used in society and explain the impact of water use on ecosystems.
	HS.ES.11.4	Analyze the major water pollutants to identify their sources and describe their relationship to human and environmental health.
	HS.ES.11.5	Compare and contrast point-source and nonpoint-source pollution; provide illustrative examples.

	HS.ES.11.6	Describe environmental conditions and human activities that cause groundwater pollution and ocean water pollution.
	HS.ES.11.7	Construct a model to explain how a water treatment plant works.
	HS.ES.11.8	Relate the importance of wetlands to the health of aquatic ecosystems, especially the Iowa wetlands.
	HS.ES.11.9	Discuss the ecological, political, economic, and social issues and impact of water quality in Iowa.
HS.ES.12	**The student will explain how soil is formed.**	
	HS.ES.12.1	Describe the three processes by which soil forms.
	HS.ES.12.2	Describe soil horizons that make up a soil profile.
	HS.ES.12.3	Identify and explain the four characteristics used to classify soil.
	HS.ES.12.4	Analyze land use in order to determine the effects of land use on its ecosystem(s).
HS.ES.13	**The student will explain and provide illustrative examples of changes in agriculture and food production overtime.**	
	HS.ES.13.1	Explain the importance of industrial agriculture and the green revolution.
	HS.ES.13.2	Construct and defend an argument for why the world needs to grow more food and to grow it sustainably.
	HS.ES.13.3	Diagram the cyclical impact of genetically modified food.
	HS.ES.13.4	Identify the advantages and disadvantages of industrial food production.
HS.ES.14	**The student will explain and provide illustrative examples of the effect of human influences on land.**	
	HS.ES.14.1	Identify urbanization/urban sprawl and summarize its impact on the rural environment.
	HS.ES.14.2	Identify and summarize the positive and negative effects of urbanization.
	HS.ES.14.3	Identify and describe the three categories of waste.
	HS.ES.14.4	Discuss the positive and negative consequences of landfill and incineration of solid waste; provide and defend examples.
	HS.ES.14.5	Compare and contrast biodegradable and non-biodegradable wastes; explain their significance in landfills.
	HS.ES.14.6	Identify and explain methods for reducing the volume of waste.
	HS.ES.14.7	Explain the recycling process; construct and defend an argument for or against recycling.
HS.ES.15	**Energy Resources** **The student will identify nonrenewable resources and explain their effect on the environment.**	
	HS.ES.15.1	Define energy and identify/describe different types of energy; explain environmental impact of different energy sources.
	HS.ES.15.2	Identify and describe the different types of nonrenewable resources and identify environmental implications.
	HS.ES.15.3	Compare the advantages and disadvantages of fossil fuels.
	HS.ES.15.4	Describe the most common methods of mining; analyze to describe environmental consequences of each method.
	HS.ES.15.5	Describe or illustrate the nuclear fission process.
	HS.ES.15.6	Construct a model to describe/illustrate how a nuclear power plant produces energy.
	HS.ES.15.7	Identify advantages and disadvantages of the nuclear fission process including safety concerns and radioactive waste disposal.
HS.ES.16	**The student will identify renewable resources and analyze their effect on the environment.**	
	HS.ES.16.1	Identify and list the major types of renewable resources (solar, wind, water, geothermal, biomass, tidal power, etc.); compare and contrast advantages and disadvantages of each.
	HS.ES.16.2	Compare and contrast the advantages and disadvantages of consumption of nonrenewable and renewable resources.
	HS.ES.16.3	Analyze alternative fuel research to summarize the recent advances.
HS.ES.17	**Human Impact on the Environment** **The student will identify and describe the negative impacts of humans on biodiversity.**	
	HS.ES.17.1	Analyze habitat destruction and the loss of biodiversity; construct and defend an explanation of how they are related to the endangerment of species.
	HS.ES.17.2	Distinguish between the natural rate of extinction and the accelerated rate due to human impact.
	HS.ES.17.3	Identify methods for decreasing the impact of humans on the rate of extinction.
	HS.ES.17.4	Analyze the causes of deforestation to explain their effects on biodiversity.

HS.ES.18	**The student will provide viable examples of how citizens can affect environmental policy at each level of government (local, state, and national).**	
	HS.ES.18.1	Conduct research into the history of environmental legislation in the U.S.
	HS.ES.18.2	Interpret the intent of state, federal, and international environmental laws (Clean Air Act, Clean Water Act, Endangered Species Act, Kyoto Protocol, Montreal Protocol, etc.).
	HS.ES.18.3	Recognize and describe the impact of individual choice on the environment; provide and defend examples.
	HS.ES.18.4	Identify and define principles of sustainable development; develop and defend an argument for how its implementation can maintain the environment.
HS.ES.19	**The student will identify environmental health hazards and discuss risk assessment.**	
	HS.ES.19.1	Identify and describe types of environmental health hazards.
	HS.ES.19.2	Describe the impact of air pollutants on human health.
	HS.ES.19.3	Compare and contrast epidemiology and toxicology.
	HS.ES.19.4	Explore and describe reasons why individuals respond differently to the same environmental hazard.
	HS.ES.19.5	List the steps of risk assessment and apply to a relevant context of application.

Glenwood Community High School
Physics Curriculum (Grades: 11 or 12)

Course Purpose: Physics is an inquiry-based laboratory course. Through experiments, explorations, investigations, presentations and projects, students will learn essential concepts of forces and motion, conservation of energy, and interaction of energy and matter. This course will also focus on exploring the relationships between science, mathematics, engineering, and technology.

Course Outcomes	Outcome Components	Description
HS.PH.1 HS-PS2 HS-PS3	**The student will analyze data to determine how Newton's Laws of Motion affect the motion of macroscopic objects.**	
	HS.PH.1.1	Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.
	HS.PH.1.2	Interpret and solve situations to describe Newton's first law of motion.
	HS.PH.1.3	Identify and discriminate between pairs of forces to analyze motion using Newton's third law of motion.
	HS.PH.1.4	Analyze a real world situation using Newton's laws of motion to explain the motion of an object.
	HS.PH.1.5	Develop and use a model applying Newton's laws of motion to a real scenario.
HS.PH.2 HS-PS2 HS-PS3	**The student will plan and carry out investigations to analyze linear motion, angular motion, projectile motion and freefall.**	
	HS.PH.2.1	Define the state of freefall and the value of the acceleration due to gravity.
	HS.PH.2.2	Construct graphs of velocity and acceleration to analyze the motion of an object.
	HS.PH.2.3	Collect data to support kinematic equations for displacement, velocity, and time under conditions of constant acceleration.
	HS.PH.2.4	Compare and contrast graphical representations describe the motion of accelerated and non-accelerated objects.
	HS.PH.2.5	Identify appropriate coordinate systems to solve problems with vectors.
	HS.PH.2.6	Calculate resultant vectors by using graphical and mathematical methods (right triangle trigonometry) to describe the motion of an object.
	HS.PH.2.7	Apply the kinematic equations to solve problems involving projectile motion.
	HS.PH.2.8	Relate Newton's Law of Gravitation to Kepler's Laws of Planetary Motion.
	HS.PH.2.9	Analyze and interpret uniform circular motion to explain centripetal force.
HS.PH.3 HS-PS2 HS-PS3 HS-ETS1	**The student will apply scientific and engineering ideas to design, analyze, and refine a device that minimize the force on a macroscopic object during a collision.**	
	HS.PH.3.1	Conduct an experiment to determine the relationship between momentum and force.
	HS.PH.3.2	Students will design a model to demonstrate the law of conservation of momentum.
	HS.PH.3.3	Develop a model to distinguish between inelastic, completely inelastic, and elastic collisions.
	HS.PH.3.4	Use data to calculate the change in kinetic energy due to a collision.
	HS.PH.3.5	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
HS.PH.4 HS-PS2 HS-PS3 HS-ETS1	**The student will describe and calculate the relationship between work done on, the energy of, and the power used by an object or system to analyze an object or system.**	
	HS.PH.4.1	Identify situations to analyze gravitational potential energy, kinetic, elastic potential energy, and thermal energy are present.
	HS.PH.4.2	Analyze situations to prove the mechanical energy of a system is conserved.

	HS.PH.4.3	Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.
	HS.PH.4.4	Conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system.
	HS.PH.4.5	Use data to calculate the relationship between work done on, the energy of the object or system, and the power used by an object or system.
HS.PH.5 HS-PS2 HS-PS4 HS-PS3 HS-ETS1	**The student will develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction.**	
	HS.PH.5.1	Create a model to describe the concept of electric field.
	HS.PH.5.2	Collect data to determine the magnitude and direction of the electric force on a charged particle in an electric field.
	HS.PH.5.3	Create models to compare and contrast gravitational fields, electric fields and magnetic fields.
	HS.PH.5.4	Use data to explain how electric currents and magnets exert a force on each other.
	HS.PH.5.5	Use data and formulas to solve problems involving moving charges and current carrying wires in the presence of magnetic fields.
HS.PH.6 HS-PS2 HS-PS4 HS-PS3 HS-ETS1	**The student will develop and use models to investigate the relationships between voltage, resistance, and current using Ohm's Law.**	
	HS.PH.6.1	Create a model to describe the basic properties of an electric current.
	HS.PH.6.2	Use data to calculate resistance, current, and potential difference using Ohm's Law.
	HS.PH.6.3	Conduct an experiment to determine factors affecting resistance in a wire.
	HS.PH.6.4	Use a model to interpret and construct circuit diagrams.
	HS.PH.6.5	Collect data to calculate the equivalent resistance for a circuit of resistors and capacitors in series and parallel; find the current in and potential across each component in the circuit.
	HS.PH.6.6	Collect data to calculate electric power and the cost of running electrical appliances.
HS.PH.7 HS-PS4 HS-PS3 HS-ETS1	**The student will plan and carry out investigations to demonstrate how waves carry and transfer energy.**	
	HS.PH.7.1	Use a model to describe the measurable properties of waves such as frequency, wavelength, amplitude and period.
	HS.PH.7.2	Conduct an experiment to compare and contrast wave speeds through different mediums.
	HS.PH.7.3	Develop a model to demonstrate how sound waves are produced by resonance in both open and closed pipes.
	HS.PH.7.4	Obtain evidence to explain the relationship between frequency and wavelength of electromagnetic waves.
	HS.PH.7.5	Use data to calculate the energy of an electromagnetic wave/particle given the frequency or wavelength of the wave/particle.

Glenwood Community High School
Chemistry Curriculum
Approved Date – January 2019 & Adjusted December 2021

Course Purpose: The student will gain an understanding of the different forms of matter and energy. The class begins by looking at the individual types of matter, how to describe matter using the periodic table, and the physical and chemical properties of different classifications of matter. Next, the class will focus on how different types of matter interact through chemical reactions and how variables can have an effect on a reaction's rate and equilibrium position. The student will use mathematical computations to analyze the relationship between energy and matter in chemical reactions.

Course Outcomes	Outcome Components	Description
HS.CH.1 CHEM1 HS-PS1 HS-PS3 HS-ESS2	**The student will develop and use models to explain the development of atomic theory.**	
	HS.CH.1.1	Develop and refine an atomic model and explain how models changed with the discovery of subatomic particles.
	HS.CH.1.2	Use Dalton's atomic theory to describe the nature of matter.
	HS.CH.1.3	Use atomic number and mass number to gain information about a particular atom.
	HS.CH.1.4	Identify isotopes of an element given the number of subatomic particles, mass number, or shorthand notation.
	HS.CH.1.5	Conduct an experiment to explain how properties of elements are related to their structure.
	HS.CH.1.6	Data to calculate the atomic mass number given percent abundance of naturally occurring isotopes.
HS.CH.2 CHEM2 HS-PS1 HS-PS3 HS-PS4 HS-ESS1	**The student will analyze trends on the periodic table to predict properties of matter.**	
	HS.CH.2.1	Create a model to distinguish among principal energy levels, energy sublevels, and atomic orbital.
	HS.CH.2.2	Determine the electron configuration of the elements using the Aufbau Principle.
	HS.CH.2.3	Determine the number of valence electrons of an element based on its position on the periodic table to explain the chemical properties of the element.
	HS.CH.2.4	Use an element's position on the periodic table to justify the physical properties of the element.
	HS.CH.2.5	Use the periodic table to identify trends in ionization energy, electronegativity, and the relative sizes of atoms and ions.
	HS.CH.2.6	Analyze atomic emission spectra of cations to explain how photons are produced.
HS.CH.3 CHEM3 HS-PS1 HS-PS2 HS-PS3 HS-ESS3	**The student will construct a model to describe Ionic bonding.**	
	HS.CH.3.1	Construct a model to illustrate the formation of a neutral ionic compound between a cation and anion in the proper ratio.
	HS.CH.3.2	Use data to compare and contrast the physical properties of ionic compounds.

	HS.CH.3.3	Determine the oxidation state of transition metals from names or compound formulas.
	HS.CH.3.4	Draw Lewis Structures of main group elements.
	HS.CH.3.5	Define and identify polyatomic groups.
HS.CH.4 CHEM4 HS-PS1 HS-PS2 HS-PS3	**The student will construct a model to describe Covalent/Metallic bonding.**	
	HS.CH.4.1	Make a model to determine the shape of molecules (ball and stick - tetrahedral, trigonal pyramidal, trigonal planar, bent, linear).
	HS.CH.4.2	Use the electronegativity trend on the periodic table to determine the polarity of a bond.
	HS.CH.4.3	Explain the 'sea of electrons' model of metallic bonding.
	HS.CH.4.4	Use data to compare and contrast the physical properties of ionic and molecular compounds.
	HS.CH.4.5	Compare and contrast differences between single, double, and triple bonds based on the number of electrons shared.
	HS.CH.4.6	Use data to compare and contrast the physical properties of ionic, molecular, and network solids.
HS.CH.5 CHEM4 HS-PS1 HS-PS2 HS-PS3	**The student will construct a model to demonstrate how matter changes in chemical reactions.**	
	HS.CH.5.1	Predict the products of single and double replacement reaction types, using reference materialto support and defend.
	HS.CH.5.2	Construct a model to classify reaction type based on the properties of the reactants.
	HS.CH.5.3	Identify the physical and chemical properties throughout a chemical change through the process of scientific experimentation.
	HS.CH.5.4	Balance equations using the proper symbols in order to demonstrate the Law of Conservation of Mass.
	HS.CH.5.5	Construct a demonstration using collision theory to explain factors that affect the rate of reaction.
HS.CH.6 HS-PS1 HS-PS2 HS-PS3	**The student will use stoichiometry to compare relative amounts of energy and matter.**	
	HS.CH.6.1	Compare the atomic mass to macroscopic mass using the molar mass.
	HS.CH.6.2	Calculate particles, mass, and moles of any substance using conversion factors.
	HS.CH.6.3	Calculate the percent composition of a compound.
	HS.CH.6.4	Calculate the empirical formula of a compound using the percent composition.
	HS.CH.6.5	Compare the amounts of reactants and products using coefficients as mole ratios.
	HS.CH.6.6	Define and apply the concepts of theoretical, actual, and percent yield.
HS.CH.7 HS-PS1 HS-PS2 HS-PS3 HS-ESS2	**The student will construct a model to demonstrate the postulates of the Kinetic Molecular Theory that describe the behavior of ideal gases.**	
	HS.CH.7.1	Compare and contrast ideal gases to real gases.
	HS.CH.7.2	Students will apply the gas laws to solve real world problems corresponding to a gas sample temperature, pressure, and volume.
	HS.CH.7.3	Students will select the appropriate units for each parameter for each gas law.
	HS.CH.7.4	Students will calculate the relative volume of gases in a chemical reaction using mole ratio, partial, and molar volume.

	HS.CH.7.5	Students will develop and use a model to show pressure differences between two systems.
HS.CH.8 HS-PS1 HS-PS2 HS-PS3 HS-ESS2	**The student will use data to analyze and characterize solutions.**	
	HS.CH.8.1	Apply terms solute, solvent, aqueous solution, homogeneous, and heterogeneous to describe a solution.
	HS.CH.8.2	Analyze data to determine the affect the solubility of solid and aqueous solutes in a solvent
	HS.CH.8.3	Collect data to express the concentration of a solution using the proper units.
	HS.CH.8.4	Predict boiling point and freezing point to describe the colligative property of a solution.
	HS.CH.8.5	Interpret a solubility curve to distinguish between an unsaturated, saturated, and supersaturated solution.
HS.CH.9	**The student will determine the properties and changes of acid/base solutions to describe experimental practices and data.**	
	HS.CH.9.1	Compare and contrast the Arrhenius acid/base definition to the Bronsted-Lowry acid/base.
	HS.CH.9.2	Explain the relationship between a strong acid and its conjugate base, and between a weak acid and its conjugate base.
	HS.CH.9.3	Differentiate between strong and weak acids/bases based on electrolyte strength.
	HS.CH.9.4	Solve neutralization equations using stoichiometry.
	HS.CH.9.5	Explain how water dissociates with a pH = 7.
	HS.CH.9.6	Calculate pH and pOH from ion concentrations.
	HS.CH.9.7	Explain what a buffer is and identify common buffer solutions.
HS.CH.10	**The student will determine the properties and changes to a system by adding or removing energy (thermochemistry).**	
	HS.CH.10.1	Identify exothermic and endothermic reactions.
	HS.CH.10.2	Describe the effect of a catalyst on the activation energy using a potential energy diagram.
	HS.CH.10.3	Calculate the energy change of the system by measuring the temperature change of the surroundings.
	HS.CH.10.4	Plan and carry out an investigation to measure the energy flowing into or out of the system (calorimetry).
HS.CH.11	**The student will construct an explanation of how equilibrium shifts by adding or removing reactants, products, or changing the pressure of a system.**	
	HS.CH.11.1	Solve Keq problems involving the initial concentrations, the changes that occur in each substance, and the resulting equilibrium concentrations (ICE tables)
	HS.CH.11.2	Manipulate a system to predict the direction which equilibrium will shift in response to change in concentration, volume, pressure, and temperature. (Le Chatelier's principle).
	HS.CH.11.3	Define equilibrium, equilibrium equations, and write Keq equations.
	HS.CH.11.4	Explain solubility, using the concept of equilibrium.
	HS.CH.11.5	Define a precipitate and using solubility rules, predict reaction products.
HS.CH.12	**The student will construct an explanation of how oxidation/reduction reactions work.**	
	HS.CH.12.1	Balance redox reactions using the half-reaction method.
	HS.CH.12.2	Determine oxidation states given oxidation rules.
	HS.CH.12.3	Explain and label a galvanic cell.
	HS.CH.12.4	Explain how redox reactions produce a current.

HS.CH.12 Redox reactions if time allows (optional)

Glenwood Community High School
PLTW (PBS) Principles of Biomedical Science Curriculum (Grades: 9-12)
Approved Date – June 2021

Course Purpose: In the introductory course of the PLTW Biomedical Science program, the student will explore concepts of biology and medicine as they take on roles of different medical professionals to solve real-world problems. Over the course of the year, the student will be challenged in various scenarios including investigating a crime scene to solve a mystery, diagnosing and proposing treatment to patients in a family medical practice, to tracking down and containing a medical outbreak at a local hospital, stabilizing a patient during an emergency, and collaborating with others to design solutions to local and global medical problems.

Course Outcome	Outcome Components	Description
HS.PBS.1	**The student will analyze a crime scene to determine the cause of death through scenarios and data. (PBS 1.1.1-1.1.4)**	
	HS.PBS.1.1	Identify the steps to processing a crime scene including the details needed on a crime scene sketch.
	HS.PBS.1.2	Explain the different forms of evidence found at a crime scene, how infallible they are, and how they are useful in resolving potential criminal cases.
	HS.PBS.1.3	Explain the composition of blood and the ABO system.
	HS.PBS.1.4	Graph and analyze experimental data to determine the height associated with bloodstain patterns
HS.PBS.2	**The student will examine the structure and function of DNA (genes and chromosomes) and how DNA can be used for identification. (PBS 1.1.5-1.17)**	
	HS.PBS.2.1	Explain the structure of DNA and properties of DNA.
	HS.PBS.2.2	Explain and demonstrate how restriction enzymes work to cut DNA.
	HS.PBS.2.3	Model the steps of gel electrophoresis and analyze the resulting restriction fragment length polymorphisms (RFLPs) using sample DNA strands and a given restriction enzyme.
	HS.PBS.2.4	Explain how gel electrophoresis can be used to examine DNA differences between individuals.
HS.PBS.3	**The student will explain how an autopsy assists with a determination of the cause, mechanism, and manner of death. (PBS 1.2.1-1.2.3)**	
	HS.PBS.3.1	Interpret a toxicology report to determine whether substances in the body played a role in a death.
	HS.PBS.3.2	Evaluate evidence to determine time of death.
	HS.PBS.3.3	Compare and contrast the basic anatomy and physiology of the body systems
HS.PBS.4	**The student will evaluate how the heart anatomy is related to its function in the body. (PBS 1.2.4-1.2.6)**	
	HS.PBS.4.1	Identify the main structures of the heart (chambers and valves) and describe their functions.
	HS.PBS.4.2	Identify the path of the major blood vessels to and from the heart.
	HS.PBS.4.3	Use medical information and a gross examination to diagnose heart diseases or disorders.

HS.PBS.5	**The student will explain the procedures healthcare professionals take to evaluate a patient's health when being seen in a healthcare setting. (PBS 2.1.1-2.1.3 and 2.1.6)**	
	HS.PBS.5.1	Explain how vital signs reflect the anatomy and physiology of key human body systems and the interaction of these systems.
	HS.PBS.5.2	Identify the main assessments in a routine physical exam (look and listen).
	HS.PBS.5.3	Explain the importance of patient privacy and the protection of medical information and evaluate scenarios to determine HIPAA compliance
HB.PBS.6	**The student will analyze the information a doctor would apply to gain insight of the patient's problems to make a diagnosis. (PBS 2.1.4 - 2.1.5)**	
	HS.PBS.6.1	Identify the information that can be gathered from routine blood tests (CBC, Lipid Panel, Basic Metabolic Panel).
	HS.PBS.6.2	Interpret blood testing and physical exam results.
	HS.PBS.6.3	Explain how the body maintains homeostasis.
HS.PBS.7	**The student will examine how genetic disorders (mutations and nondisjunction) can affect the health of an individual. (PBS 2.2.)**	
	HS.PBS.7.1	Explain the process of mitosis and the impact of this process on health.
	HS.PBS.7.2	Explain the process of protein synthesis and the impact gene mutations have on the health of an individual.
	HS.PBS.7.3	Analyze pedigrees and use them to assess the probability of inheriting specific traits.
	HS.PBS.7.4	Analyze chromosome number and structure on a karyotype and evaluate the genetic health of an individual using their karyotype.
	HS.PBS.7.5	Dissect how the process of meiosis can lead to differences in chromosome number and how chromosomal differences impact structure and function in the human body.
HS.PBS.8	**The student will discover how pathogens cause disease and the steps humans apply to stop the spread of infection. (PBS 3.1)**	
	HS.PBS.8.1	Identify the characteristics of the six categories of infectious agents.
	HS.PBS.8.2	Explain how using the chain of infection of a pathogen helps humans identify how to stop its spread (ex. Covid).
	HS.PBS.8.3	Explain how our bodies fight infection (innate and acquired immunity).
	HS.PBS.8.4	Characterize bacteria based on Gram stain results to determine treatment.
HS.PBS.9	**The student will interpret physiological evidence from collections and assessments to evaluate a patient's condition. (PBS 3.2)**	
	HS.PBS.9.1	Explain how an individual's health status is assessed and evaluated.
	HS.PBS.9.2	Explain the effects of anaphylaxis on body systems.
	HS.PBS.9.3	Evaluate the severity of bleeding in a patient and describe an appropriate response.
	HS.PBS.9.4	Explain criteria for triage categories and be able to assign triage categories to a set of patients awaiting emergency care.

Glenwood Community High School
Human Body Systems (HBS) Curriculum (Grades: 10-12)
Approved Date – June 2018

Course Purpose: The student will examine the interactions of human body systems as they explore identity, power, movement, protection, and homeostasis in the body. Exploring science in action, students build organs and tissues on a skeletal Maniken®; use data acquisition software to monitor body functions such as muscle movement, reflex and voluntary action, and respiration; and take on the roles of biomedical professionals to solve real-world medical cases.

Course Outcomes	Outcome Components	Description
HS.HBS.1	**The student will differentiate between the systems and structures involved in basic body processes. (HBS 1.1)**	
	HS.HBS.1.1	Identify the functions of different human body systems, and list the major organs within each system.
	HS.HBS.1.2	Describe how multiple body systems are interconnected and how those interconnections and interactions are necessary for life.
	HS.HBS.1.3	Use directional terms and regional terms to pinpoint locations on the body.
HS.HBS.2	**The student will analyze the human skeletal system to determine its functions. (HBS 1.2)**	
	HS.HBS.2.1	Identify the characteristics of the four categories of human tissue and analyze the structure of various human tissue types to infer function.
	HS.HBS.2.2	Explain how differences in bone structure contribute to a person's unique identity.
	HS.HBS.2.3	Identify and locate all of the bones of the human skeletal system.
HS.HBS.3	**The student will explain the importance of gel electrophoresis and describe how it works. (HBS 1.3)**	
	HS.HBS.3.1	Explain how restriction enzymes cut DNA.
	HS.HBS.3.2	Describe how gel electrophoresis separates DNA fragments.
	HS.HBS.3.3	Describe how gel electrophoresis can be used to examine DNA differences between individuals.
	HS.HBS.3.4	Perform the steps of gel electrophoresis and analyze the resulting restriction fragments to determine the identity of a missing person.
HS.HBS.4	**The student will identify and describe the structure and function of the central and peripheral nervous system. (HBS 2.1)**	
	HS.HBS.4.1	Identify major regions of the human brain.
	HS.HBS.4.2	Identify the primary functions of each of the regions of the brain.
	HS.HBS.4.3	Apply knowledge of brain structure and function to determine the parts of the brain related to specific human actions, emotions, and/or dysfunctions.
	HS.HBS.4.4	Interpret how a breakdown in communication in the central nervous system would impact the function of the human body.
HS.HBS.5	**The student will illustrate how the nervous system relays messages. (HBS 2.2)**	
	HS.HBS.5.1	Explain how the nervous system relies on specialized cells called neurons to pass signals to and from the brain and spinal cord.
	HS.HBS.5.2	Describe how the movement of ions across the cell membrane of a neuron generates an action potential and propagates electrical signals.
	HS.HBS.5.3	Explain how neurons communicate at the synapse.
	HS.HBS.5.4	Describe how brain processing differs in reflex and voluntary responses.
	HS.HBS.5.5	Outline what takes place in the human body from an initial stimulus to a response.
HS.HBS.6	**The student will investigate how the endocrine system functions. (HBS 2.3)**	
	HS.HBS.6.1	Describe the way in which hormones interact with target cells.
	HS.HBS.6.2	Explain how the human body uses feedback mechanisms to maintain proper hormone levels.
	HS.HBS.6.3	Model a feedback loop that shows how the body maintains homeostasis.
HS.HBS.7	**The student will examine key structures of the eye to determine how it works. (HBS 2.4)**	
	HS.HBS.7.1	Identify the key structures of the eye.
	HS.HBS.7.2	Diagram the path of light as it enters the eyes and travels to the brain for processing.

HS.HBS.8	**The student will identify organs of the digestive system and investigate the factors involved in digesting food (HBS 3.2)**	
	HS.HBS.8.1	Explain that enzymes are designed to be highly specific, and that the structure of the enzyme's active site determines the substrate it acts upon.
	HS.HBS.8.2	Identify specific enzymes that digest carbohydrates, fats, and proteins at sites along the digestive tract.
	HS.HBS.8.3	Describe the structure and function of the organs in the digestive system.
	HS.HBS.8.4	Describe how energy is stored in ATP.
	HS.HBS.8.5	Outline what happens to a bite of food as it travels down the digestive tract.
HS.HBS.9	**The student will describe the structure of the respiratory system, specifically the lungs, and the basic mechanics of breathing. (HBS 3.3)**	
	HS.HBS.9.1	Identify the structures of the respiratory system.
	HS.HBS.9.2	Explain how the structure of the lungs facilitates the exchange of oxygen and carbon dioxide between air and the body.
	HS.HBS.9.3	Describe the steps of respiration.
	HS.HBS.9.4	Analyze data collected using a spirometer to determine tidal volume, vital capacity, and minute volume.
	HS.HBS.9.5	Describe the action of specific medication on the body and investigate how this action helps treat and control disease.
HS.HBS.10	**The student will evaluate the structure and function of the human urinary system. (HBS 3.4)**	
	HS.HBS.10.1	Describe how the structure of the kidney relates to its function in the body.
	HS.HBS.10.2	Explore the role of the nephron as the structural and functional unit of the kidney.
	HS.HBS.10.3	Describe the connections between urine and blood and the exchange of ions and fluids that occurs across the nephron.
	HS.HBS.10.4	Explain how the body uses hormones and feedback to maintain a water balance.
	HS.HBS.10.5	Illustrate the path of urine formation through the kidney.
HS.HBS.11	**The student will illustrate that a joint is the location at which two or more bones connect, allowing movement and providing support to the human skeleton. (HBS 4.1)**	
	HS.HBS.11.1	Describe the motion at joints, such as flexion and extension.
	HS.HBS.11.2	Demonstrate the types of movement possible at a joint and match range of motion photographs to specific actions.
HS.HBS.12	**The student will describe the structure and function of the muscular system. (HBS 4.2)**	
	HS.HBS.12.1	Contrast how the three types of muscle tissue differ in structure and function.
	HS.HBS.12.2	Explain the sliding filament mechanism of muscle contraction.
	HS.HBS.12.3	Describe the connection between nerves and muscle.
	HS.HBS.12.4	Demonstrate the process of muscle contraction and describe the phenomenon of rigor mortis.
HS.HBS.13	**The student will explain how the circulatory system functions and describe its structure. (HBS 4.3)**	
	HS.HBS.13.1	Explain the relationship between the heart and the lungs.
	HS.HBS.13.2	Identify the body's major arteries and veins and name the body region supplied by each.
	HS.HBS.13.3	Explain that unlike arteries, veins contain valves that prevent the backflow of blood.
	HS.HBS.13.4	Describe pulse and blood pressure as they relate to cardiovascular health.
	HS.HBS.13.5	Trace blood flow in pulmonary and systemic circulation.
	HS.HBS.13.6	Calculate and interpret cardiac output values and relate the amount of blood pumped by the heart to the health of other body systems and organs.
HS.HBS.14	**The student will describe how muscles use energy to contract (HBS 4.4) demonstrating a knowledge of muscle fatigue and how to condition muscles to work more efficiently.**	
	HS.HBS.14.1	Describe how the body uses high energy molecules such as creatine phosphate, glycogen, and glucose to supply ATP to working muscle.
	HS.HBS.14.2	Explain that muscle fatigue occurs with prolonged or repetitive use of a muscle group.
	HS.HBS.14.3	Describe ways in which an athlete can prepare his or her body for the stress of an athletic event.
	HS.HBS.14.4	Illustrate the body's response to the stages of exercise.
HS.HBS.15	**The student will describe the structure and function of the integumentary system. (HBS 5.1)**	

	HS.HBS.15.1	Describe the structure and function of the two main layers and the accessory organs of the skin.
	HS.HBS.15.2	Explain how different degrees of burns damage layers of the skin.
	HS.HBS.15.3	Describe how the human body senses and processes signals of pain.
	HS.HBS.15.4	Interpret how burn damage to the skin will affect the function of the organ and overall homeostasis in the body.
	HS.HBS.15.5	Outline what happens inside the body when a person feels pain.
HS.HBS.16	**The student will describe the structures of different types of bones and how bone repairs itself after injury. (HBS 5.2)**	
	HS.HBS.16.1	Identify the four main types of bone.
	HS.HBS.16.2	Describe the structure and function of compact and spongy bone.
	HS.HBS.16.3	Describe the types of bone fractures.
	HS.HBS.16.4	Apply knowledge of hormones and of bone remodeling to explain calcium balance in the body.
	HS.HBS.16.5	Describe the stages of bone healing after injury.
HS.HBS.17	**The student will describe the structure and function of the lymphatic and immune system. (HBS 5.3)**	
	HS.HBS.17.1	Explain how blood type is determined by the antigens present on red blood cells.
	HS.HBS.17.2	Describe the genetics of blood type.
	HS.HBS.17.3	Describe the interaction between antigens and antibodies.
	HS.HBS.17.4	Analyze simulated blood samples to determine blood type.
	HS.HBS.17.5	Produce and analyze a family pedigree for blood type and determine potential donors for a transfusion.
	HS.HBS.17.6	Graph and interpret antibody data collected after an infection and relate this data to the response of body cells.
	HS.HBS.17.7	Diagram an immune response to a common cold.
	HS.HBS.17.8	Apply knowledge of specific immunity to deduce how vaccines function.
HS.HBS.18	**The student will explore how the body maintains health and wellness. (HBS 6.1)**	
	HS.HBS.18.1	Describe how the body systems respond to extreme external environments.
	HS.HBS.18.2	Illustrate disease in the human body, from its initial symptoms to eventual diagnosis and treatment.

Glenwood Community High School
AP Chemistry Curriculum (Grades: 11-12)

Course Purpose: The AP Chemistry curriculum is guided by The College Board. All material covered in lecture and in the lab activities has been geared toward preparing students for the AP exam at the end of the year. The student will gain a deeper understanding of the principles discussed in General Chemistry, utilize advanced problem solving skills, and compose lab book entries that guide critical thinking.

The AP Chemistry outcomes and components are taken directly from the College Board approved curriculum. The outcomes are the College Board's *Big Ideas* and the components are the *Learning Objectives.* The College Board approved curriculum can be found here: AP Chemistry Curriculum

Course Outcomes	Outcome Components	Description	Power Component
AP.CH.1 APCHEM1	**The student will explain how chemical elements are fundamental building materials of matter, and all matter can be understood in terms of arrangements of atoms. These atoms retain their identity in chemical reactions.**		
	AP.CH.1.1 LO1.1	Justify the observation that the ratio of the masses of the constituent elements in any pure sample of that compound is always identical on the basis of the atomic molecular theory.	x
	AP.CH.1.2 LO1.2	Select and apply mathematical routines to mass data to identify or infer the composition of pure substances and/or mixtures.	
	AP.CH.1.3 LO1.3	Select and apply mathematical relationships to mass data in order to justify a claim regarding the identity and/or estimated purity of a substance.	
	AP.CH.1.4 LO1.4	Connect the number of particles, moles, mass, and volume of substances to one another, both qualitatively and quantitatively.	x
	AP.CH.1.5 LO1.5	Explain the distribution of electrons in an atom or ion based upon data.	
	AP.CH.1.6 LO1.6	Analyze data relating to electron energies for patterns and relationships.	x
	AP.CH.1.7 LO1.7	Describe the electronic structure of the atom, using PES data, ionization energy data, and/or Coulomb's law to construct explanations of how the energies of electrons within shells in atoms vary.	x
	AP.CH.1.8 LO1.8	Explain the distribution of electrons using Coulomb's law to analyze measured energies.	
	AP.CH.1.9 LO1.9	Predict and/or justify trends in atomic properties based on location on the periodic table and/or the shell model.	
	AP.CH.1.10 LO1.10	Justify with evidence the arrangement of the periodic table and can apply periodic properties to chemical reactivity.	
	AP.CH.1.11 LO1.11	Analyze data, based on periodicity and the properties of binary compounds, to identify patterns and generate hypotheses related to the molecular design of compounds for which data are not supplied.	x
	AP.CH.1.12 LO1.12	Explain why a given set of data suggests, or does not suggest, the need to refine the atomic model from a classical shell model with the quantum mechanical model.	
	AP.CH.1.13 LO1.13	Given information about a particular model of the atom, the student will determine if the model is consistent with specified evidence.	
	AP.CH.1.14 LO1.14	Use data from mass spectrometry to identify the elements and the masses of individual atoms of a specific element.	
	AP.CH.1.15 LO1.15	Justify the selection of a particular type of spectroscopy to measure properties associated with vibrational or electronic motions of molecules.	
	AP.CH.1.16 LO1.16	Design and/or interpret the results of an experiment regarding the absorption of light to determine the concentration of an absorbing species in a solution.	
	AP.CH.1.17 LO1.17	Express the law of conservation of mass quantitatively and qualitatively using symbolic representations and particulate drawings.	

	AP.CH.1.18 LO1.18	Apply conservation of atoms to the rearrangement of atoms in various processes.	
	AP.CH.1.19 LO1.19	Design, and/or interpret data from, an experiment that uses gravimetric analysis to determine the concentration of an analyte in a solution.	x
	AP.CH.1.20 LO1.20	Design, and/or interpret data from, an experiment that uses titration to determine the concentration of an analyte in a solution.	x
AP.CH.2 APCHEM2	**The student will use bonding and intermolecular forces to describe the physical and chemical properties of elements and molecules.**		
	AP.CH.2.1 LO2.1	Predict properties of substances based on their chemical formulas, and provide explanations of their properties based on particle views.	x
	AP.CH.2.2 LO2.2	Explain the relative strengths of acids and bases based on molecular structure, inter particle forces, and solution equilibrium.	x
	AP.CH.2.3 LO2.3	Use aspects of particulate models (i.e., particle spacing, motion, and forces of attraction) to reason about observed differences between solid and liquid phases and among solid and liquid materials.	
	AP.CH.2.4 LO2.4	Use KMT and concepts of intermolecular forces to make predictions about the macroscopic properties of gases, including both ideal and non-ideal behaviors.	x
	AP.CH.2.5 LO2.5	Refine multiple representations of a sample of matter in the gas phase to accurately represent the effect of changes in macroscopic properties on the sample.	
	AP.CH.2.6 LO2.6	Apply mathematical relationships or estimation to determine macroscopic variables for ideal gases.	x
	AP.CH.2.7 LO2.7	Explain how solutes can be separated by chromatography based on intermolecular interactions.	
	AP.CH.2.8 LO2.8	Draw and/or interpret representations of solutions that show the interactions between the solute and solvent.	x
	AP.CH.2.9 LO2.9	Create or interpret representations that link the concept of molarity with particle views of solutions.	
	AP.CH.2.10 LO2.10	Design and/or interpret the results of a separation experiment (filtration, paper chromatography, column chromatography, or distillation) in terms of the relative strength of interactions among and between the components.	
	AP.CH.2.11 LO2.11	Explain the trends in properties and/or predict properties of samples consisting of particles with no permanent dipole on the basis of London dispersion forces.	
	AP.CH.2.12 LO2.12	Qualitatively analyze data regarding real gases to identify deviations from ideal behavior and relate these to molecular interactions.	x
	AP.CH.2.13 LO2.13	Describe the relationships between the structural features of polar molecules and the forces of attraction between the particles.	
	AP.CH.2.14 LO2.14	Apply Coulomb's law qualitatively (including using representations) to describe the interactions of ions, and the attractions between ions and solvents to explain the factors that contribute to the solubility of ionic compounds.	
	AP.CH.2.15 LO2.15	Explain observations regarding the solubility of ionic solids and molecules in water and other solvents on the basis of particle views that include intermolecular interactions and entropic effects.	
	AP.CH.2.16 LO2.16	Explain the properties (phase, vapor pressure, viscosity, etc.) of small and large molecular compounds in terms of the strengths and types of intermolecular forces.	
	AP.CH.2.17 LO2.17	Predict the type of bonding present between two atoms in a binary compound based on position in the periodic table and the electronegativity of the elements.	
	AP.CH.2.18 LO2.18	Rank and justify the ranking of bond polarity on the basis of the locations of the bonded atoms in the periodic table.	

	AP.CH.2.19 LO2.19	Create visual representations of ionic substances that connect the microscopic structure to macroscopic properties, and/or use representations to connect the microscopic structure to macroscopic properties (e.g., boiling point, solubility, hardness, brittleness, low volatility, lack of malleability, ductility, or conductivity).	
	AP.CH.2.20 LO2.20	Explain how a bonding model involving delocalized electrons is consistent with macroscopic properties of metals (e.g., conductivity, malleability, ductility, and low volatility) and the shell model of the atom.	
	AP.CH.2.21 LO2.21	Use Lewis diagrams and VSEPR to predict the geometry of molecules, identify hybridization, and make predictions about polarity.	x
	AP.CH.2.22 LO2.22	Use Lewis diagrams and VSEPR to predict the geometry of molecules, identify hybridization, and make predictions about polarity.	
	AP.CH.2.23 LO2.23	Create a representation of an ionic solid that shows essential characteristics of the structure and interactions present in the substance.	
	AP.CH.2.24 LO2.24	Explain a representation that connects properties of an ionic solid toits structural attributes and to the interactions present at the atomic level.	x
	AP.CH.2.25 LO2.25	Compare the properties of metal alloys with their constituent elements to determine if an alloy has formed, identify the type of alloy formed, and explain the differences in properties using particulate level reasoning.	
	AP.CH.2.26 LO2.26	Use the electron sea model of metallic bonding to predict or make claims about the macroscopic properties of metals or alloys.	
	AP.CH.2.27 LO2.27	Create a representation of a metallic solid that shows essential characteristics of the structure and interactions present in the substance.	
	AP.CH.2.28 LO2.28	Explain a representation that connects properties of a metallic solid to its structural attributes and to the interactions present at the atomic level.	x
	AP.CH.2.29 LO2.29	Create a representation of a covalent solid that shows essential characteristics of the structure and interactions present in the substance.	
	AP.CH.2.30 LO2.30	Explain a representation that connects properties of a covalent solid to its structural attributes and to the interactions present at the atomic level.	x
	AP.CH.2.31 LO2.31	Create a representation of a molecular solid that shows essential characteristics of the structure and interactions present in the substance.	
	AP.CH.2.32 LO2.32	Explain a representation that connects properties of a molecular solid to its structural attributes and to the interactions present at the atomic level.	x
AP.CH.3 APCHEM3	**The student will be able to explain how changes in matter involve the rearrangement and/or reorganization of atoms and/or the transfer of electrons.**		
	AP.CH.3.1 LO3.1	Translate among macroscopic observations of change, chemical equations, and particle views.	
	AP.CH.3.2 LO3.2	Translate an observed chemical change into a balanced chemical equation And justify thechoice of equation type(molecular, ionic, or netionic) in terms of utility for the given circumstances.	x
	AP.CH.3.3 LO3.3	Use stoichiometric calculations to predict the results of performing a reaction in the laboratory and/or to analyze deviations from the expected results.	
	AP.CH.3.4 LO3.4	Relate quantities (measured mass of substances, volumes of solutions, or volumes and pressures of gases) to identify stoichiometric relationships for a reaction, including situations involving limiting reactants and situations in which the reaction has not gone to completion.	x
	AP.CH.3.5 LO3.5	Design a plan in order to collect data on the synthesis or decomposition of a compound to confirm the conservation of matter and the law of definite proportions.	
	AP.CH.3.6 LO3.6	Use data from synthesis or decomposition of a compound to confirm the conservation of matter and the law of definite proportions.	
	AP.CH.3.7 LO3.7	Identify compounds as Brønsted-Lowry acids, bases, and/or conjugate acid-base pairs, using proton-transfer reactions to justify the identification.	

	AP.CH.3.8 LO3.8	Identify redox reactions and justify the identification in terms of electron transfer.	
	AP.CH.3.9 LO3.9	Design and/or interpret the results of an experiment involving a redox titration.	
	AP.CH.3.10 LO3.10	Evaluate the classification of a process as a physical change, chemical change, or ambiguous change based on both macroscopic observations and the distinction between rearrangement of covalent interactions and noncovalent interactions.	
	AP.CH.3.11 LO3.11	Interpret observations regarding macroscopic energy changes associated with a reaction or process to generate a relevant symbolic and/or graphical representation of the energy changes.	
	AP.CH.3.12 LO3.12	Make qualitative or quantitative predictions about galvanic or electrolytic reactions based on half-cell reactions and potentials and/ or Faraday's laws.	x
	AP.CH.3.13 LO3.13	Analyze data regarding galvanic or electrolytic cells to identify properties of the underlying redox reactions.	
AP.CH.4 **APCHEM4**	**The student will explain that rates of chemical reactions are determined by details of the molecular collisions.**		
	AP.CH.4.1 LO4.1	Design and/or interpret the results of an experiment regarding the factors (i.e., temperature, concentration, surface area) that may influence the rate of a reaction.	
	AP.CH.4.2 LO4.2	Analyze concentration vs. time data to determine the rate law for a zeroth-, first-, or second-order reaction.	
	AP.CH.4.3 LO4.3	Connect the half-life of a reaction to the rate constant of a first-order reaction and justify the use of this relation in terms of the reaction being a first-order reaction.	
	AP.CH.4.4 LO4.4	Connect the rate law for an elementary reaction to the frequency and success of molecular collisions, including connecting the frequency and success to the order and rate constant, respectively.	x
	AP.CH.4.5 LO4.5	Explain the difference between collisions that convert reactants to products and those that do not in terms of energy distributions and molecular orientation.	
	AP.CH.4.6 LO4.6	Use representations of the energy profile for an elementary reaction (from the reactants, through the transition state, to the products) to make qualitative predictions regarding the relative temperature dependence of the reaction rate.	x
	AP.CH.4.7 LO4.7	Evaluate alternative explanations, as expressed by reaction mechanisms, to determine which are consistent with data regarding the overall rate of a reaction, and data that can be used to infer the presence of a reaction intermediate.	
	AP.CH.4.8 LO4.8	Translate among reaction energy profile representations, particulate representations, and symbolic representations (chemical equations) of a chemical reaction occurring in the presence and absence of a catalyst.	
	AP.CH.4.9 LO4.9	Explain changes in reaction rates arising from the use of acid-base catalysts, surface catalysts, or enzyme catalysts, including selecting appropriate mechanisms with or without the catalyst present.	
AP.CH.5 APCHEM5	**The student will use the laws of thermodynamics to describe the essential role of energy and explain and predict the direction of changes in matter.**		
	AP.CH.5.1 LO5.1	Create or use graphical representations in order to connect the dependence of potential energy to the distance between atoms and factors, such as bond order (for covalent interactions) and polarity (for intermolecular interactions), which influence the interaction strength.	

	AP.CH.5.2 LO5.2	Relate temperature to the motions of particles, either via particulate representations, such as drawings of particles with arrows indicating velocities, and/or via representations of average kinetic energy and distribution of kinetic energies of the particles, such as plots of the Maxwell-Boltzmann distribution.	
	AP.CH.5.3 LO5.3	Generate explanations or make predictions about the transfer of thermal energy between systems based on this transfer being due to a kinetic energy transfer between systems arising from molecular collisions.	x
	AP.CH.5.4 LO5.4	Use conservation of energy to relate the magnitudes of the energy changes occurring in two or more interacting systems, including identification of the systems, the type (heat versus work), or the direction of energy flow.	
	AP.CH.5.5 LO5.5	Use conservation of energy to relate the magnitudes of the energy changes when two non-reacting substances are mixed or brought into contact with one another.	
	AP.CH.5.6 LO5.6	Use calculations or estimates to relate energy changes associated with heating/cooling a substance to the heat capacity, relate energy changes associated with a phase transition to the enthalpy of fusion/ vaporization, relate energy changes associated with a chemical reaction to the enthalpy of the reaction, and relate energy changes to work.	x
	AP.CH.5.7 LO5.7	Design and/or interpret the results of an experiment in which calorimetry is used to determine the change in enthalpy of a chemical process (heating/cooling, phase transition, or chemical reaction) at constant pressure.	
	AP.CH.5.8 LO5.8	Draw qualitative and quantitative connections between the reaction enthalpy and the energies involved in the breaking and formation of chemical bonds.	
	AP.CH.5.9 LO5.9	Make claims and/or predictions regarding relative magnitudes of the forces acting within collections of interacting molecules based on the distribution of electrons within the molecules and the types of intermolecular forces through which the molecules interact.	
	AP.CH.5.10 LO5.10	Support the claim about whether a process is a chemical or physical change (or may be classified as both) based on whether the process involves changes in intramolecular versus intermolecular interactions.	
	AP.CH.5.11 LO5.11	Identify the noncovalent interactions within and between large molecules, and/or connect the shape and function of the large molecule to the presence and magnitude of these interactions.	
	AP.CH.5.12 LO5.12	Use representations and models to predict the sign and relative magnitude of the entropy change associated with chemical or physical processes.	x
	AP.CH.5.13 LO5.13	Predict whether or not a physical or chemical process is thermodynamically favored by determination of (either quantitatively or qualitatively) the signs of both and, and calculation or estimation of when needed.	
	AP.CH.5.14 LO5.14	Determine whether a chemical or physical process is thermodynamically favorable by calculating the change in standard Gibbs free energy.	x
	AP.CH.5.15 LO5.15	Explain how the application of external energy sources or the coupling of favorable with unfavorable reactions can be used to cause processes that are not thermodynamically favorable to become favorable.	
	AP.CH.5.16 LO5.16	Use Le Chatelier's principle to make qualitative predictions for systems in which coupled reactions that share a common intermediate drive formation of a product.	x
	AP.CH.5.17 LO5.17	Make quantitative predictions for systems involving coupled reactions that share a common intermediate, based on the equilibrium constant for the combined reaction.	

	AP.CH.5.18 LO5.18	Explain why a thermodynamically favored chemical reaction may not produce large amounts of product (based on consideration of both initial conditions and kinetic effects), or why a thermodynamically unfavored chemical reaction can produce large amounts of product for certain sets of initial conditions.	
AP.CH.6 APCHEM6	**The student will quantitatively and qualitatively describe the equilibrium position of a reaction system, that any bond or intermolecular attraction that can be formed can also be broken. Students can manipulate the equilibrium position by changing the reaction conditions.**		
	AP.CH.6.1 LO6.1	Given a set of experimental observations regarding physical, chemical, biological, or environmental processes that are reversible, construct an explanation that connects the observations to the reversibility of the underlying chemical reactions or processes.	
	AP.CH.6.2 LO.6.2	Given a manipulation of a chemical reaction or set of reactions (e.g., reversal of reaction or addition of two reactions), determine the effects of that manipulation on Q or K.	
	AP.CH.6.3 LO6.3	Connect kinetics to equilibrium by using reasoning about equilibrium, such as Le Chatelier's principle, to infer the relative rates of the forward and reverse reactions.	x
	AP.CH.6.4 LO6.4	Given a set of initial conditions (concentrations or partial pressures) and the equilibrium constant, K, use the tendency of Q to approach K to predict and justify the prediction as to whether the reaction will proceed toward products or reactants as equilibrium is approached.	
	AP.CH.6.5 LO6.5	Given data (tabular, graphical, etc.) from which the state of a system at equilibrium can be obtained, calculate the equilibrium constant, K.	
	AP.CH.6.6 LO6.6	Given a set of initial conditions (concentrations or partial pressures) and the equilibrium constant, K, use stoichiometric relationships and the law of mass action (Q equals K at equilibrium) to determine qualitatively and/or quantitatively the conditions at equilibrium for a system involving a single reversible reaction.	x
	AP.CH.6.7 LO6.7	For a reversible reaction that has a large or small K, to determine which chemical species will have very large versus very small concentrations at equilibrium.	x
	AP.CH.6.8 LO6.8	Use Le Chatelier's principle to predict the direction of the shift resulting from various possible stresses on a system at chemical equilibrium.	
	AP.CH.6.9 LO6.9	Use Le Chatelier's principle to design a set of conditions that will optimize a desired outcome, such as product yield.	
	AP.CH.6.10 LO6.10	Connect Le Chatelier's principle to the comparison of Q to K by explaining the effects of the stress on Q and K.	
	AP.CH.6.11 LO6.11	Generate or use a particulate representation of an acid (strong or weak or polyprotic) and a strong base to explain the species that will have large versus small concentrations at equilibrium.	
	AP.CH.6.12 LO6.12	Reason about the distinction between strong and weak acid solutions with similar values of, including the percent ionization of the acids, the concentrations needed to achieve the same, and the amount of base needed to reach the equivalence point in a titration.	
	AP.CH.6.13 LO6.13	Interpret titration data for monoprotic or polyprotic acids involving titration of a weak or strong acid by a strong base (or a weak or strong base by a strong acid) to determine the concentration of the titrant and the weak acid, or the weak base.	x
	AP.CH.6.14 LO6.14	Based on the dependence of on temperature, reason that neutrality requires as opposed to requiring, including especially the applications to biological systems.	
	AP.CH.6.15 LO6.15	Identify a given solution as containing a mixture of strong acids and/or bases and calculate or estimate the (and concentrations of all chemical species) in	

		the resulting solution.	
	AP.CH.6.16 LO6.16	Given solution as being the solution of a monoprotic weak acid or base (including salts in which one ion is a weak acid or base), calculate the concentration of all species in the solution, and/ or infer the relative strengths of the weak acids or bases from given equilibrium concentrations.	
	AP.CH.6.17 LO6.17	Given an arbitrary mixture of weak and strong acids and bases (including polyprotic systems), determine which species will react strongly with one another (i.e., with) and what species will be present in large concentrations at equilibrium.	
	AP.CH.6.18 LO6.18	Design a buffer solution with a target pH and buffer capacity by selecting an appropriate conjugate acid-base pair and estimating the concentrations needed to achieve the desired capacity.	x
	AP.CH.6.19 LO6.19	Relate the predominant form of a chemical species involving a labile proton (i.e., protonated/deprotonated form of a weak acid) to the solution and the associated with the labile proton.	
	AP.CH.6.20 LO6.20	Identify a solution as being a buffer solution and explain the buffer mechanism in terms of the reactions that would occur on addition of acid or base.	
	AP.CH.6.21 LO6.21	Predict the solubility of a salt, or rank the solubility of salts, given the relevant values.	x
	AP.CH.6.22 LO6.22	Interpret data regarding solubility of salts to determine, or rank, the relevant values.	
	AP.CH.6.23 LO6.23	Interpret data regarding the relative solubility of salts in terms of factors (common ions,) that influence the solubility.	
	AP.CH.6.24 LO6.24	Analyze the enthalpic and entropic changes associated with the dissolution of a salt, using particulate level interactions and representations.	
	AP.CH.6.25 LO6.25	Express the equilibrium constant in terms of ΔG and RT and use this relationship to estimate the magnitude of K and, consequently, the thermodynamic favorability of the process.	

Glenwood Community High School
Astronomy Curriculum (Grades: 9-12)

Course Purpose: This one semester course provides the opportunity to develop knowledge and understanding about the solar system, galaxy, and universe in which we live. The student will use tools of observation, problem solving, communication, and collaboration to learn about space and learn how other astronomers past and present have used tools available. Areas of study include: the process of science, including use of the tools used to observe the sky; stellar astronomy and how stars change over time; planetary astronomy; and cosmology.

Course Outcomes	Outcome Components	Description
AST1		**The student will describe the cycles of nature used in astronomy and the behavior of celestial objects in the sky.**
AST2		**The student will describe the electromagnetic spectrum and the technology which uses the electromagnetic spectrum to study space.**
AST3		**The student will compare and contrast Earth and Earth's moon to other member of the solar system.**
AST4		**The student will identify characteristics and describe solar activities of the Sun.**
AST5		**The student will examine the characteristics of various stars using current scientific evidence.**
AST6		**The student will compare and contrast the Milky Way Galaxy to other galaxies in the Universe.**
AST7		**The student will compare and contrast models and determine the best explanation of cosmology using current scientific evidence.**

Glenwood Community High School
Meteorology Curriculum

Course Purpose: This one semester course provides the opportunity to develop knowledge and understanding of weather and climate. The student will develop an understanding of the structure and function of the atmosphere including the dynamics between its matter and energy and their effect on weather and climate. Major components of weather such as temperature, humidity, pressure, precipitation, and winds and the interactions between these components will are emphasized. This course also addresses aspects of air pollution and global climate change and provides the student with an understanding of basic weather forecasting. Field experiences are an integral part of this course.

Course Outcomes	Outcome Components	Description
MET1		**The student will describe the composition, function, and structure of the Earth's atmosphere.**
MET2		**The student will examine solar influence on Earth's weather and climate.**
MET3		**The student will explain the role of water in weather and climate.**
MET4		**The student will examine daily weather patterns.**
MET5		**The student will examine annual weather patterns.**
MET6		**The student will investigate global weather.**

Glenwood Community High School
Geology Curriculum (Grades: 9-12)

Course Purpose: This one semester course provides the opportunity to develop knowledge and understanding of basic scientific principles that apply to the earth and our natural environment. Emphasis is placed on current and historical geologic processes of North America with particular emphasis on the geology found in our local area. Laboratory work includes exercises with maps, rock structures, minerals, and fossils. New discoveries and environmental issues are discussed. Field experiences are an integral part of this course.

Course Outcomes	Outcome Components	Description
GEO1		**The student will examine the composition of the Earth.**
GEO2		**The student will identify different rocks and minerals.**
GEO3		**The student will investigate the Earth as a dynamic system.**
GEO4		**The student will predict an area's topography using geological maps.**
GEO5		**The student will identify how the Earth's surface is continuously reshaped.**
GEO6		**The student will describe the history of the Earth.**
GEO7		**The student will investigate the geology of the Midwest, Iowa, and Loess Hills.**