

**Jefferson County High School  
Course Syllabus**

**A. Course: Physical Science**

**B. Department: Science**

**C. Course Description:** The student will explore the relationships between matter and energy in the universe. The student will study scientific principles that control matter and energy and how they relate to everyday life. The student will have fun while learning organizational and study skills that will help him experience success in college. This course focuses on mechanics involving observations, laboratory experiments, and projects.

**D. Grade Term:** Full year class

**E. Grading Scale**

| <u>Range</u> | <u>Regular</u> |
|--------------|----------------|
| 93-100       | A              |
| 85-92        | B              |
| 75-84        | C              |
| 70-74        | D              |

**F. Term Dates**

- a. 1<sup>st</sup> 9 Weeks August 5, 2016 – October 7, 2016
- b. 2<sup>nd</sup> 9 Weeks October 8, 2016 – December 16, 2016
- c. 3<sup>rd</sup> 9 Weeks January 5, 2017 – March 15, 2017
- d. 4<sup>th</sup> 9 Weeks March 16, 2017 – May 25, 2017

**G. Textbook(s):** Glencoe Physical Science

**H. Other Required Reading**

- a. None

**I. Other Resources**

- a. Odysseyware

**J. Major Assignments**

- a. Lab activities and reports
- b. Research assignments
- c. Projects and/or presentations
- d. Test/quiz assignments

**K. Procedures for Parental Access to Instructional Materials**

- a. Aspen Parent Portal
- b. Instructor's Website
- c. Email Instructor
- d. Parent Teacher Conference
  - a. There are two designated conference dates during the school year. Parents who would like to request additional meetings may make appointments for conferences with the teachers (during their planning periods), counselors, or a principal by telephoning the school office.

#### **L. Field Trips**

- a. Any schedule fieldtrip will have a definite educational purpose and will reflect careful planning. Signed permission forms will be obtained when an off campus trip is planned.

#### **M. Standards & Objectives**

### **I Can Statement Scope & Sequence (First 9 Weeks)**

#### **Motion and Force**

*CLE 3202.3.1 Compare and contrast the relationships among speed, position, time, velocity, and acceleration.*

*PSC.WCE.1: Model the motion of objects through graphical analysis.*

*PSC.WCE.2: Calculate velocity, given position and time; and acceleration given change in velocity and time.*

- i. I can distinguish between, speed, and velocity through textual and mathematical analysis.
- ii. I can draw, model and analyze distance-time graphs for velocity and acceleration.
- iii. I can calculate velocity, given position and time.
- iv. I can calculate acceleration, given change in velocity and time.

*CLE 3202.3.2 Describe and apply Newton's three laws of motion. PSC.WCE.3: Algebraically manipulate Newton's 3 Laws. PSC.WCE.4: Explain momentum conceptually and mathematically.*

- v. I can relate inertia, force, or action-reaction forces to Newton's three laws of motion.
- vi. I can solve equations dealing with Newton's laws of motion.
- vii. I can calculate force, given mass and acceleration.
- viii. I can calculate momentum, given mass and velocity.

*CLE 3202.3.3 Examine the Law of Conservation of Momentum in real world situations.*

*PSC.WCE.5: Create a working model that accomplishes a task by utilizing Newton's Laws.*

- ix. I can give an example of and explain how an objects momentum can be changed.
- x. I can modify, evaluate and explain the construction of a model (i.e. Rube Goldberg, crash helmets, etc...) created to represent Newton's laws of motion.

*SPI 3221.T/E.2 Differentiate among elements of the engineering design cycle: design constraints, model building, testing, evaluating, modifying, and retesting.*

- xi. I can differentiate among elements of the engineering design cycle: design constraints, model building, testing, evaluating, modifying, and retesting.

*SPI 3221.T/E.3 Explain the relationship between the properties of a material and the use of the material in the application of a technology.*

- xii. I can explain the relationship between the properties of a material and the use of the material in the application of a technology.

*CLE 3202.4.1 Distinguish the differences between mass and weight*

- xiii. I can explain the difference between mass and weight through words, models and demonstration.

*CLE 3202.4.2 Relate gravitational force to mass*

- xiv. I can model and explain a difference in gravitational force given information about changing the mass of an object.

*SPI 3221.Math.1 Understand the mathematical principles behind the physical sciences. I can understand the mathematical patterns behind the concepts of mass and weight.*

- xv. I can understand the mathematical patterns behind the concepts of mass and weight.

### **Nature of Science**

*CLE 3202.Inq.1 Recognize that science is a progressive endeavor that reevaluates and extends what is already accepted.*

- xvi. I can recognize that science is a progressive endeavor that reevaluates and extends what is already accepted.

## **I Can Statement Scope & Sequence (Second 9 Weeks)**

### **Work and Energy**

*CLE 3202.3.4, CLE 3202.4.3 Demonstrate the relationships among work, power, and machines.*

- i. I can demonstrate and conceptually explain the relationship between work, power and the six simple machines.

*PSC.WCE.6: Model the six simple machines and explain how they make work easier.*

- ii. I can model the six simple machines: inclined plane, screw, wedge, lever, pulley, and wheel and axle, and explain how they make work easier.

*PSC.WCE.7: Algebraically manipulate equations involving work and power.*

- iii. I can calculate work, given force and distance, and understand the derivation of this formula.

*SPI 3221.Math.1 Understand the mathematical principles behind the physical sciences.*

- iv. I can calculate power, given work and time, and understand the derivation of this formula.

*PSC.WCE.8: Model the relationship between kinetic and potential energy.*

- v. I can model the relationship between kinetic and potential energy (i.e.: pendulum, roller coaster, ...)

*CLE 3202.2.6 Investigate the Law of Conservation of Energy.*

- vi. I can model, explain and give real world examples of the Law of Conservation of Energy.

### **Waves, Light and Sound**

*CLE 3202.2.1 Identify and explain the nature of sound and light energy*

- vii. I can compare and contrast the properties of sound and light energy.

*CLE 3202.3.6 Investigate the properties and behaviors of mechanical and electromagnetic waves.*

viii. I can investigate the nature of sound waves and light waves.

ix. I can diagram the structure of a wave and describe the properties of a wave.

x. I can mathematically determine wavelength, given frequency.

xi. I can calculate wave speed, given frequency and wavelength.

*CLE 3202.2.2 Explore the nature of sound and light energy.*

xii. I can distinguish between transverse and longitudinal waves.

xiii. I can model and differentiate between mechanical and electromagnetic waves.

xiv. I can compare and contrast wave reflection, diffraction, refraction, and interference.

### **Electricity**

*CLE 3202.2.4 Apply the fundamental principles and applications of electricity.*

xv. I can identify the parts of an electric circuit, draw schematics and build a simple circuit.

xvi. I can compare and contrast series and parallel circuits, and defend the benefits of one over the other.

xvii. I can use Ohm's law to calculate voltage, resistance, or current.

xviii. I can investigate energy efficient technology

# I Can Statement Scope & Sequence (Third 9 Weeks)

## Matter and Energy

*CLE 3202.1.1 Explore matter in terms of its physical and chemical properties.*

*PSC.WCE.16: Calculate density.*

*SPI 3221.Math.2 Utilize appropriate mathematical equations and processes to solve basic physical science problems.*

*PSC.WCE.17: Model the three major phases/states of matter.*

*PSC.WCE.18: Explore phase change in relationship to temperature scales.*

- i. I can investigate, observe and describe physical properties of matter, such as density, phase change, etc..., and chemical properties of matter, such as flammability, reactivity, etc.... I can calculate density ( $d = m/v$ ).
- ii. I can model and compare the volume, shape and particle arrangement in the three major states of matter.
- iii. I can compare three temperature scales and the freezing and boiling point of water on each scale.
- iv. I can convert between the Celsius, Kelvin, and Fahrenheit temperature scales.

*CLE 3202.1.4 Investigate chemical and physical changes.*

- v. I can differentiate between physical and chemical changes through textual analysis and lab investigation.

*CLE 3202.1.5 Evaluate pure substances and mixtures.*

*PSC.WCE.19: Investigate the Law of Conservation of Mass.*

- vi. I can classify matter as a pure substance or a mixture.
- vii. I can investigate, classify and explain mixtures as heterogeneous or homogeneous.

*CLE 3202.2.6 Investigate the Law of Conservation of Energy.*

*PSC.WCE.20: Differentiate between cycles of matter and flow of energy.*

- viii. I can investigate and defend the Law of Conservation of Mass.
- ix. I can investigate and defend the Law of Conservation of Energy.
- x. I can differentiate and model the difference between cycles of matter and flow of energy.

*CLE 3202.2.3 Examine the applications and effects of heat energy.*

*PSC.WCE.21: Explore phase change in relationship to endothermic and exothermic changes.*

- xi. I can model and differentiate between heat and temperature.
- xii. I can analyze and investigate conduction, convection, and radiation.

- xiii. I can determine when a phase change is exothermic or endothermic through textual and observational analysis.

*CLE 3202.1.8 Investigate relationships among the pressure, temperature, and volume of gases and liquids.*

*PSC.WCE.22: Manipulate algebraically the equations related to: specific heat, temperature scales and gas laws.*

*SPI 3202.Inq.2 Design and conduct scientific investigations to explore new phenomena, verify previous results, test how well a theory predicts, and compare opposing theories.*

*SPI 3202.Inq.3 Use appropriate tools and technology to collect precise and accurate data.*

*SPI 3202.Inq.4 Apply qualitative and quantitative measures to analyze data and draw conclusions that are free of bias.*

*SPI 3202.Inq.5 Compare experimental evidence and conclusions with those drawn by others about the same testable question.*

- xiv. I can calculate specific heat using the given equation,  $Q = mc\Delta T$ , and experimental data.
- xv. I can determine the effects of pressure, temperature, or volume on the behavior of gases (Boyles Law, Charles Law).
- xvi. I can use the gas law equations to solve for a missing variable, given a scenario or a set of data.
- xvii. I can carry out and explain the results of an experiment that shows the relationship between temperature and volume of a gas. I can use appropriate tools and technology to collect precise and accurate data.
- xviii. I can apply qualitative and quantitative measures to analyze data and draw conclusions that are free of bias.
- xix. I can compare experimental evidence and conclusions with those drawn by others about the same testable question.

## **I Can Statement Scope & Sequence (Fourth 9 Weeks)**

### **Atoms, Compounds and the Periodic Table**

*PSC.WCE.23: Research the development of the atomic model throughout history.*

*CLE 3202.1.2 Describe the structure and arrangement of atomic particles.*

*PSC.WCE.24: Model and explain the structure of the atom.*

- i. I can explain the differences between the atomic models developed throughout history.
- ii. I can model and explain the structure of the atom.

*CLE 3202.1.3 Characterize and classify elements based on their atomic structure.*

*PSC.WCE.25: Utilize the periodic table to explain the properties of an element.*

*PSC.WCE.26: Utilize the periodic table to determine an atom's ionic charge.*

- iii. I can identify and model the relative location and relative mass of the three types of subatomic particles in an atom.
- iv. I can use information from the periodic table to determine properties of an element.
- v. I can use the periodic table to identify elements as metals, nonmetals and metalloids.

*CLE 3202.1.6 Distinguish between common ionic and covalent compounds.*

*PSC.WCE.27: Determine the neutrons in an isotope, given its symbol and mass number.*

- vi. I can use the periodic table to determine an atom's ionic charge.
- vii. I can predict whether two main group elements will bond with ionic or covalent bonding, based on their location in the periodic table.
- viii. I can determine the number of each subatomic particle in an isotope, given its symbol and mass number.

*CLE 3202.1.7 Construct chemical formulas for common compounds.*

- ix. I can use information from the periodic table to determine and write the chemical formulas of compounds.

### **Chemical and Nuclear Reactions**

*CLE 3202.1.9 Apply the Laws of Conservation of Mass/Energy to balance chemical equations.*

*PSC.WCE.28: Classify and explain the four types of chemical reactions.*

- x. I can mathematically balance chemical equations through calculating the coefficient and subscript numbers.
- xi. I can explain the balancing of chemical reactions through the law of conservation of mass.
- xii. I can classify synthesis, decomposition, single replacement, and double replacement reactions.

*CLE 3202.2.3 Examine the applications and effects of heat energy.*

- xiii. I can identify endothermic and exothermic chemical reactions from temperature changes through textual and lab analysis.

*CLE 3202.1.10 Distinguish among acids, bases, and neutral substances.*

- xiv. I can classify acidic, basic and neutral substances solutions by given pH through textual and lab analysis (using indicators).

*CLE 3202.2.5 Distinguish between nuclear fission and nuclear fusion.*

*SPI 3221.T/E.1 Explore the impact of technology on social, political, and economic systems.*

*SPI 3221.T/E.4 Describe the dynamic interplay among science, technology, and engineering within living, earth-space, and physical systems.*

- xv. I can compare and contrast nuclear fission and fusion.
- xvi. I can research nuclear energy and its impact on science and society.

