

8th Grade Science Course Syllabus

A. Course
8th Grade Science

B. Department
Science

C. Course Description

Eighth grade science is an exploration into biological balance and change, chemistry and basic forces of nature. This course uses inquiry, student-centered laboratory experiences, activities, and focused discussion to promote a deep understanding of concepts and STEM problem solving techniques. While many topics are a basic survey of underlying scientific principles, this course provides one of the first opportunities students may have to learn science at a more complex level. Biological topics include biodiversity, classification, adaptation, variation, and natural selection. Chemistry ranges from atomic structure and importance to the Law of Conservation of Mass. Emphasis is placed on understanding and effectively using the periodic table as a chemistry tool. The basics of electromagnetic forces are taught including the construction of an electromagnet and gravitational laws are examined. This course is a rigorous, hands-on, exploration of science.

D. Grade Term
Full Year

E. Grading Scale

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

F. Term Dates

- 1st 9 Weeks August 5, 2016 – October 7, 2016
- 2nd 9 Weeks October 8, 2016 – December 16, 2016
- 3rd 9 Weeks January 5, 2017 – March 15, 2017
- 4th 9 Weeks March 16, 2017 – May 25, 2017

G. Textbook(s)
Glencoe Science, Grade 8, ISBN:978-0-07-890136-2

H. Other Required Reading
Current articles and other course related readings assigned by teacher

I. Other Resources

- a. Odysseyware

J. Major Assignments

Various projects assigned by teacher

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

Embedded Inquiry

SPI 0807.Inq.1 Design a simple experimental procedure with an identified control and appropriate variables.

- I can design a simple experimental procedure.
- I can identify a control in an experiment.
- I can explain the difference between independent and dependent variables.

SPI 0807.Inq.2 Select tools and procedures needed to conduct a moderately complex experiment

- I can identify the tools used for measurement in an experiment.
- I can identify the procedure need to conduct an experiment.

SPI 0807.Inq.3 Interpret and translate data into a table, graph, or diagram.

- I can create a bar, line, or circle graph from data collected during an experiment.
- I can identify the appropriate graph to use based on the data collected.
- I can explain the purpose of the experiment through the use of the data collected.

SPI 0807.Inq.4 Draw a conclusion that establishes a cause and effect relationship supported by evidence.

- I can determine a cause and effect relationship through evidence collected during an experiment.
- I can explain the evidence collected during an experiment through the use of a cause and effect relationship.

SPI 0807.Inq.5 Identify a faulty interpretation of data that is due to bias or experimental error.

- I can determine when a researcher has an interest in the outcome of an experiment (bias) or part of a procedure will cause the experiment to fail.

Embedded Technology and Engineering

SPI 0807.T/E.1 Identify the tools and procedures needed to test the design features of a prototype.

- I can use the engineering design process to solve a given problem with multiple criteria/constraints or evaluate a protocol to determine if the engineering design process was successfully applied to solve a given problem.

SPI 0807.T/E.2 Evaluate a protocol to determine if the engineering design process was successfully applied.

- I can identify tools and procedures needed to test the design features of prototype.

SPI 0807.T/E.3 Distinguish between the intended benefits and the unintended consequences of a new technology.

- I can compare the benefits and unintended consequences of human activities and technology, and their impact on earth's biodiversity.

SPI 0807.T/E.4 Differentiate between adaptive and assistive engineered products (e.g., food, biofuels, medicines, integrated pest management).

- I can explain the difference between adaptive and assistive engineered products.

Biodiversity and Change

SPI 0807.5.1 Use a simple classification key to identify an unknown organism.

- I can list the levels of classification in order from most general to most specific (domain, kingdom, phylum, class, order, family, genus, and species).
- I can classify organisms based on appropriate characteristics (e.g. type of symmetry, way it obtains energy, presence of certain body systems, method of reproduction, prokaryotic and eukaryotic, etc.).
- I can select characteristics of plants and animals that serve as the basis for developing a classification (dichotomous) key.
- I can use a classification key to classify/identify an unknown organism.
- I can create and apply a simple classification key to identify an organism.
- I can write the scientific name of an organism, given its classification
- (binomial nomenclature).

SPI 0807.5.2 Analyze structural, behavioral, and physiological adaptations to predict which populations are likely to survive in a particular environment

- I can differentiate between structural, behavioral, and physiological adaptations.
- I can compare and contrast the ability of an organism to survive under different environmental conditions.
- I can develop a logical argument for a population's chance of survival in a given environment based on adaptations.
- I can analyze evidence from geology, paleontology and comparative anatomy to provide the basis for natural selection and that specific traits within a population increase some individual's probability of surviving.
- I can construct and evaluate a hypothesis to predict how a species may change in response to changing environmental pressures by forming specific physical or behavioral characteristics

SPI 0807.5.3 Analyze data on levels of variation within a population to make predictions about survival under particular environmental conditions.

- I can analyze data on levels of variation within a population to make predictions about survival under particular environmental conditions.
- I can develop an argument based on evidence for a population's chance of survival based on the level of variation within the population.
- I can defend a claim using evidence and reasoning that describes how genetic variation of traits in a population, increase some individuals' probability of surviving and reproducing in a specific environment. (application of 7th grade genetics)
- I can analyze existing evidence about the effect of a specific invasive species on native populations and design a possible solution to eradicate the invasive population. (Examples: kudzu, red eared sliders, brown snake, European starlings, etc.)

SPI 0807.5.4 Identify several reasons for the importance of maintaining the earth's biodiversity.

- I can research and communicate the major factors responsible for reducing the amount of global biodiversity.
- I can prepare graphs that demonstrate how the amount of biodiversity has changed in a particular continent or biome.
- I can develop an argument identifying the benefits of biodiversity.
- I can analyze the consequences of losing biodiversity.

SPI 0807.5.5 Compare fossils found in sedimentary rock to determine their relative age.

- I can differentiate between absolute age and relative age.
- I can analyze data from index fossils, and the structure and ordering of rock layers to infer the relative age of fossils.

- I can describe relative age of fossils formed in sedimentary rock layers based on the Law of Superposition.
- I can construct scientific arguments to support claims that different types of fossils provide evidence of: 1) the diversity of life that existed in the past, 2) relationship between past and current life forms, and/or 3) environmental changes that have occurred during Earth's history.

Matter

SPI 0807.9.1 Recognize that all matter consists of atoms.

- I can identify atoms as the fundamental particles that make-up matter (matter, atoms, and particles).
- I can distinguish between subatomic parts of the atom (protons, neutrons, electrons, nucleus, and electron clouds/shells) in terms of location, charge, and relative size, and use these parts to develop a model of the atom.
- I can explain how the structure and arrangement of atoms gives a sample of matter its physical and chemical properties.
- I can identify, explain and measure the physical properties of matter, such as: mass, weight, volume, density, temperature, state, ductility, malleability, solubility, and conductivity.
- I can identify and explain the chemical properties of matter, such as: reactivity and flammability.
- I can analyze data and use evidence to support the claim that physical properties and chemical properties can be used to identify matter.
- I can calculate the density of various objects using the formula, $d=m/v$.
- I can model the particle arrangement and type of motion associated with different states of matter.
- I can explain how energy is measured by temperature and how levels of the energy affect the movement and arrangement of particles differently.

SPI 0807.9.2 Identify the common outcome of all chemical changes.

- I can differentiate between physical and chemical changes through textual and investigation-based observational analysis.
- I can analyze data such as data based on the properties of substances, to determine if a physical or chemical change has occurred.
- I can explain how chemical changes always result in new substances being formed.
- I can observe, identify and communicate evidences of a chemical change such as: unexpected gas given off, precipitate formed, unexpected color change, odor change, unexpected temperature change, etc....

SPI 0807.9.3 Classify common substances as elements or compounds based on their symbols or formulas.

- I can identify pure substances and distinguish between elements and compounds by their names, symbols and formulas.
- I can describe how the characteristics of a compound are different than the characteristics of their component parts.

SPI 0807.9.4 Differentiate between a mixture and a compound.

- I can diagram the relationship between atoms and compound molecules (such as H₂O, NaCl, etc.), and between atoms and elemental molecules (such as H₂, Cl₂, N₂, etc.).
- I can compare and contrast elements, compounds, and mixtures.
- I can differentiate between different types of mixtures. (homogenous (including solutions) and heterogeneous)
- I can experimentally separate components of a homogeneous mixture and a heterogeneous mixture.
- I can write the steps of the experimental scientific procedure delineating the process of separating components of a mystery mixture.

SPI 0807.9.5 Describe the chemical makeup of the atmosphere.

- I can explain how the chemical makeup of the atmosphere illustrates a mixture of gases
- I can describe and represent in graphical form the atmosphere as consisting of (from most abundant to least abundant) nitrogen, oxygen, argon and trace substances (carbon dioxide, hydrogen, helium, water vapor, etc.).

SPI 0807.9.6 Compare the particle arrangement and type of particle motion associated with different states of matter.

- I can model the particle arrangement and type of motion associated with different states of matter.

- I can explain how energy is measured by temperature and how levels of the energy affect the movement and arrangement of particles differently.

SPI 0807.9.7 Apply an equation to determine the density of an object based on its mass and volume.

- I can calculate the density of various objects using the formula, $d=m/v$.

SPI 0807.9.8 Interpret the results of an investigation to determine whether a physical or chemical change has occurred.

- I can differentiate between physical and chemical changes through textual and investigation-based observational analysis.
- I can analyze data such as data based on the properties of substances, to determine if a physical or chemical change has occurred.

SPI 0807.9.9 Use the periodic table to determine the properties of an element.

- I can identify the atomic number, atomic mass, number of protons, neutrons, and electrons in an atom of an element using the periodic table.
- I can classify an element as metal, nonmetal, or metalloid based on its location on the periodic table and its characteristics (conductivity, luster, ductility, malleability, and color)
- I can compare and contrast periods versus families/groups.
- I can identify general properties and relationships of the families/groups of elements (Alkali Metals, Alkaline Earth Metals, Halogens, Noble Gases).
- I can identify and/or predict general trends (mass, size, reactivity, metallic character, electron clouds/shells and valence electrons) in the periodic table.
- I can determine if a compound is ionic or covalent using evidence from chemical formulas and the periodic table.

SPI 0807.9.10 Identify the reactants and products of a chemical reaction.

- I can differentiate between the reactants and products of a chemical reaction and equation.

SPI 0807.9.11 Recognize that in a chemical reaction the mass of the reactants is equal to the mass of the products (Law of Conservation of Mass).

- I can determine the total mass of the products in a chemical reaction, given the mass of the reactants.
- I can explain the importance of coefficients, subscripts and the yield sign in a chemical equation.
- I can explain the relationship between a balanced chemical equation and the Law of Conservation of Mass.
- I can use coefficients in order to balance an equation so that it meets the Law of Conservation of Mass.

SPI 0807.9.12 Identify the basic properties of acids and bases.

- I can determine whether a substance is acidic, basic or neutral based upon its reaction to indicators, pH paper or probes.
- I can classify substances as acidic, basic or neutral using the pH scale.
- I can compare and contrast the properties of acids, bases, and neutral solutions (taste, indicator color change, pH and feel).
- I can support a claim that identifies a substance as acidic, basic or neutral based on experimental evidence with at least three pieces of data.

Forces in Nature

SPI 0807.12.1 Recognize that electricity can be produced using a magnet and wire coil.

- I can describe and model how to create electricity using a magnet and coiled wire.
- I can create a diagram to explain the relationship between electricity and magnetism.

SPI 0807.12.2 Describe the basic principles of an electromagnet.

- I can produce an electromagnet using a wire coil and an iron core, such as a nail, and make modifications that changes its strength (varying the number of coils, adding electricity, changing the core)
- I can diagram and describe the parts of an electromagnet.
- I can explain how to use a compass to test for the presence of an electric current.
- I can create an electromagnetic device that accomplishes a task.

SPI 0807.12.3 Distinguish among the Earth's magnetic field, a magnet, and the fields that surround a magnet and an electromagnet.

- I can develop a model to generate data for ongoing testing and modification of an electromagnet, generator or motor such that an optimal design can be achieved.
- I can determine through textual and experimental evidence that electromagnetism is a force.

- I can compare and contrast Earth's magnetic field, a magnet, and an electromagnet in terms of 1) reversibility of the poles 2) varying the strength and 3) turning on and off.
- I can design and conduct an investigation that provides evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.

SPI 0807.12.4 Distinguish between mass and weight using appropriate measuring instruments and units.

- I can distinguish between mass and weight including the tools and units of measurement.

SPI 0807.12.5 Determine the relationship among the mass of objects, the distance between these objects, and the amount of gravitational attraction.

- I can identify factors that influence the amount of gravitational force between objects (distance between the objects and mass of the objects).
- I can predict an increase or decrease in gravitational force given information about changing distance or changing mass.
- I can explain the role of gravity in ocean tides (connected with 6th grade concept of tides).

SPI 0807.12.6 Illustrate how gravity controls the motion of objects in the solar system.

- I can explain how the motion of objects in the solar system is affected by gravity (connected with 6th grade concept of the solar system).