Haddon Township High School
Course Overview

Subject Area: Science
Course Name: Introduction to Lab Science

Summary: This year-long laboratory course is designed for freshmen. It provides a fundamental study of ecology, genetics, and chemistry while using the scientific method approach during laboratory investigations. After completing this course, students will be prepared to take one of the subsequent biology courses, Lab Biology or Applied Biology.

Unit Title	Student Learning Target	Standards	Resources	Assessment
Solving Scientific Problems	*Students will:* • Sequence the steps of the scientific method. • Describe the parts of a valid experiment. • Design a valid experiment. • Use the metric system as a basic system of measurement. • Properly use data tables and graphs to display results from an experiment.	5.1 Science Practices All students will understand that science is both a body of knowledge and an evidence-based, model-building enterprise that continually extends, refines, and revises knowledge. The four Science Practices strands encompass the knowledge and reasoning skills that students must acquire to be proficient in science. 9.1 21st Century Life & Career Skills All students will demonstrate the creative, critical thinking, collaboration, and problem-solving skills needed to function successfully as both global citizens and workers in diverse ethnic and organizational cultures.	Computer, Smart Board, lab equipment such as tennis balls and air hockey pucks, meter sticks, stopwatches; graph paper, calculators, metric rulers, colored pencils	Design and conduct an experiment involving a given topic like measuring the velocity of objects in motion. The variables will be identified, a hypothesis formed, and data collected. Data will be represented in table form and in graph form. A concluding summary will be written.
Cell Life – Genetic Basics	*Students will …*	5.3 Life Science: Life	Computer with internet	Cell cycle (somatic cells)

	• Sequence the events of the somatic cell cycle. • Hypothesize why some cells might take longer than others to complete their life cycle. • Analyze how meiosis maintains a constant number of chromosomes within a species. • Infer how meiosis leads to variation in a species. • Diagram how meiosis contributes half of the chromosomes from the mother and half from the father in sexually reproducing organisms.	science principles are powerful conceptual tools for making sense of the complexity, diversity, and interconnectedness of life on Earth. Order in natural systems arises in accordance with rules that govern the physical world, and the order of natural systems can be modeled and predicted through the use of mathematics. 9.1 21st Century Life & Career Skills All students will demonstrate the creative, critical thinking, collaboration, and problem-solving skills needed to function successfully as both global citizens and workers in diverse ethnic and organizational cultures.	access, poster board, coloring supplies, rulers, projection system, textbooks, blackboard, handouts, lab materials, play dough	poster Cell cycle (somatic cells) computer lab Cell cycle (gametes) crossing over/play dough lab
Genetic Inheritance	*Students will ...* • Analyze the results obtained by Gregor Mendel in his experiments with garden peas. • Predict the possible offspring of a genetic cross by using a Punnett square. • Analyze the structure of DNA.	5.3 Life Science: Life science principles are powerful conceptual tools for making sense of the complexity, diversity, and interconnectedness of life on Earth. Order in natural systems arises in accordance with rules that govern the physical world, and the order of natural systems can be modeled and predicted through the	Lab activity packet, computer, with Internet access	"Genetic counselor activity." Includes analysis of possible sex-linked disorders that could result from choosing the male gender for their offspring

	• Identify that heredity information is contained in genes, located in the chromosomes of each cell, and each gene carries a single unit of information. • Explain that genes may be exhibited through dominant/recessive inheritance, as well as other complex inheritance patterns. • Determine how the structure of DNA enables it to reproduce itself accurately. • Relate the concept of a gene to the sequence of nucleotides in DNA. • Sequence the steps involved in protein synthesis.	use of mathematics. 9.1 21st Century Life & Career Skills All students will demonstrate the creative, critical thinking, collaboration, and problem-solving skills needed to function successfully as both global citizens and workers in diverse ethnic and organizational cultures.		
Natural Selection	*Students will ...* • Summarize Darwin's theory of natural selection • Explain how natural selection occurs • Explain how the structural and	5.3 Life Science: Life science principles are powerful conceptual tools for making sense of the complexity, diversity, and interconnectedness of life on Earth. Order in natural systems arises in	Poster board, art supplies, loose leaf, dictionaries, text books, internet visuals and information	Natural selection team poster and essay. Students will develop an imaginary creation with special adaptations for survival in its environment, then diagram and explain the adaptations of their

	physiological adaptations of organisms relate to natural selection • Distinguish among the four types of evidence for evolution.	accordance with rules that govern the physical world, and the order of natural systems can be modeled and predicted through the use of mathematics. 9.1 21st Century Life & Career Skills All students will demonstrate the creative, critical thinking, collaboration, and problem-solving skills needed to function successfully as both global citizens and workers in diverse ethnic and organizational cultures.		imaginary creature in its environment, showing how these characteristics came to develop and thrive. They will then show and tell their "story" to the class.
Plant Processes & Energy Flow	*Students will …* • Explain how the process of diffusion occurs and why it is important to cells. • Discuss how the process of evaporation is significant in the movement of water throughout plants. • Explain why organisms need a supply of energy • Relate the structures of a	5.3 Life Science: Life science principles are powerful conceptual tools for making sense of the complexity, diversity, and interconnectedness of life on Earth. Order in natural systems arises in accordance with rules that govern the physical world, and the order of natural systems can be modeled and predicted through the use of mathematics. 9.1 21st Century Life & Career Skills All students will demonstrate the	dialysis tubing, iodine and starch solutions, computers with Internet access, cycle diagrams, lab packets, fish, elodea, bromothymol blue, baby food jars, monocot & dicot seeds, cotton, test tubes	Iodine/starch dialysis tubing lab What is a seed? Lab investigation Seed respiration lab investigation Transpiration poster with presentation Food chain and web computer labs Water cycle diagram interactive study

	leaf – chloroplasts, cuticle and stomata – to the events in photosynthesis. • Distinguish between the biotic and abiotic factors in the environment • Compare how organisms satisfy their nutritional needs • Trace the path of energy and matter in an ecosystem • Analyze how nutrients are cycled in the abiotic and biotic parts of the biosphere	creative, critical thinking, collaboration, and problem-solving skills needed to function successfully as both global citizens and workers in diverse ethnic and organizational cultures.		Carbon cycle diagram interactive study Fish/plant – photosynthesis/cell respiration lab
The Classification, Properties and Changes of Matter	*Students will: ...* • Classify matter according to its composition. • Distinguish among elements, compounds, homogeneous mixtures, and heterogeneous mixtures. • Determine the density of a substance. • Relate the properties of matter to its structure. • Distinguish between	5.1 Science Practices: All students will understand that science is both a body of knowledge and an evidence-based, model-building enterprise that continually extends, refines, and revises knowledge. The four Science Practices strands encompass the knowledge and reasoning skills that students must acquire to	Glencoe *Chemistry: Concepts and Applications,* computer, Smart Board, various fruits like bananas and apples, bowls, water, lemon juice, etc.	Students will design an experiment to identify the physical and chemical changes in fruit, and to determine if these changes can be controlled. This activity will incorporate the scientific method with this unit. After the experiment is approved, hypothesis written, and variables identified, observations will be made in data table form

	physical and chemical properties. • Contrast physical and chemical changes.	be proficient in science. 5.2 Physical Science: All students will understand that physical science principles, including fundamental ideas about matter, energy, and motion, are powerful conceptual tools for making sense of phenomena in physical, living, and Earth systems science. 9.1 21st Century Life & Career Skills All students will demonstrate the creative, critical thinking, collaboration, and problem-solving skills needed to function successfully as both global citizens and workers in diverse ethnic and organizational cultures.		and data analysis completed.
Parts of the Atom	*Students will:* • Relate historic experiments to the development of the modern model of the atom. • Illustrate the modern model of the atom. • Use the atomic number and mass number of an element to determine the	5.2 Physical Science: All students will understand that physical science principles, including fundamental ideas about matter, energy, and motion, are powerful conceptual tools for making sense of phenomena in physical, living, and Earth systems science.	Computers with internet access, drawing paper, markers or colored pencils	It is 1913 and Niels Bohr has just proposed a new atomic model. Students pretend they are science reporters for a major newspaper. Their job is to write an article about the new model and compare it to previous ones. Several drawings/diagrams should be included. The article

	number of protons and neutrons. • Calculate the weighted average mass of an element given the masses and abundances of its isotopes. • Determine the number and location of electrons in an atom. • Predict the number of valence electrons an element has. • Describe how an atom can become either a cation or an anion.	9.1 21st Century Life & Career Skills All students will demonstrate the creative, critical thinking, collaboration, and problem-solving skills needed to function successfully as both global citizens and workers in diverse ethnic and organizational cultures.		should appeal to the newspaper's general readers, who have a limited knowledge of this content.
The Periodic Table	*Students will:* • Describe how the elements on the Periodic Table are in order by atomic number. • Relate the location of elements on the Periodic Table to an element's state, type and physical and chemical properties. • Explain the steps taken in the development of the Periodic Table and how the modern Periodic Table reflects that.	5.1 Science Practices: All students will understand that science is both a body of knowledge and an evidence-based, model-building enterprise that continually extends, refines, and revises knowledge. The four Science Practices strands encompass the knowledge and reasoning skills that students must acquire to be proficient in science. 5.2 Physical Science: All students will understand that physical science principles, including fundamental ideas about matter, energy, and motion, are powerful conceptual tools for making sense of	Holt *Chemistry: Visualizing Matter.* Element cards (30), periodic tables, worksheet for justifications	Mini-Mendeleev lab activity: students will be given 21 cards identifying the physical and chemical properties of these elements, and will also have 9 cards of unidentified elements also with properties provided. Students will have to predict the location of the unknown elements within the framework of the known ones, and justify their placement.

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Chemical Bonding	*Students will:* • Explain what is meant by a chemical bond • Compare and contrast characteristics of ionic, covalent, and polar covalent bonds. • Use a periodic table to help predict the type of bonding between two elements. • Build and interpret covalent molecules like water, carbon dioxide, and ammonia.	5.2 Physical Science: All students will understand that physical science principles, including fundamental ideas about matter, energy, and motion, are powerful conceptual tools for making sense of phenomena in physical, living, and Earth systems science. 9.1 21st Century Life & Career Skills All students will demonstrate the creative, critical thinking, collaboration, and problem-solving skills needed to function successfully as both global citizens and	*Chemistry: Concepts and Applications,* digital camera, computer, modeling materials, balloons, poster boards	Students will select three compounds similar to those modeled in the resource textbook used in the classroom. They will build models of the compounds, using balloons or other suitable materials, to show the preferred stable geometries. A display of models, photographs, or Power Point slides that describes the geometries will be made.

		workers in diverse ethnic and organizational cultures.		
Strengths of Acids and Bases	*Students will:* • Distinguish acids from bases by their properties. • Evaluate the central role of water in the chemistry of acids and bases. • Distinguish strong and weak acids and bases. • Relate pH to the strengths of acids and bases.	5.2 Physical Science: All students will understand that physical science principles, including fundamental ideas about matter, energy, and motion, are powerful conceptual tools for making sense of phenomena in physical, living, and Earth systems science. 9.1 21st Century Life & Career Skills All students will demonstrate the creative, critical thinking, collaboration, and problem-solving skills needed to function successfully as both global citizens and workers in diverse ethnic and organizational cultures.	*Chemistry: Concepts and Applications,* prepared color charts for comparison, serial dilutions of hydrochloric acid and sodium hydroxide if necessary, hot plate, red cabbage, distilled water, beakers, pipets, micro-plates, toothpicks, and various solutions of substances such as lemon juice, white vinegar, baking soda, and borax.	Students will conduct an experiment to measure the approximate pH values of various (about 8) household liquids. One or more indicators, like cabbage juice or litmus, will be used to determine relative pH with color changes. Students will be asked to interpret data and compare the functions of the liquids to their chemical makeup.