



Township of Ocean Schools

Assistant Superintendent
Office of Teaching and Learning

SPARTAN MISSION:

Meeting the needs of all students with a proud tradition of academic excellence.

Curriculum Documents

School: Ocean Township High School

Course: Discovery Science

Department: Science

Supervisor: Patrick Sullivan

Board Approval	Supervisor	Notes
August 2013	Patrick Sullivan	Update Standards
December 2017	Patrick Sullivan	Update Standards

Home of the Spartans!
#spartanlegacy



Timeline

Quarter	Week		Quarter	Week	
1	1	Intro to the Laboratory	3	11	Acid Base Chemistry
	2	Intro to the Laboratory		12	Compounds
	3	Intro to the Laboratory		13	Compounds
	4	Light		14	Water
	5	Light		15	Projects + Winter Break
2	6	Heat	4	16	
	7	Heat	17	Water	
	8	Pressure	18	Metabolism and Food	
	9	Pressure	19	Metabolism and Food	
	10	Acid Base Chemistry	20	Final Exam	

Time Frame	2 Weeks
Topic	
Introduction to the Laboratory	
Essential Questions	
<ul style="list-style-type: none"> • What are the independent and dependent variables? • What are the characteristics of measurement? • What is the scientific method? • What is the importance of laboratory safety? • What is the proper use and care of laboratory instrumentation? • What base units and prefixes are used in science for measuring length, mass, and volume? • What information is needed to calculate both density and percent error? • How are graphs used to distinguish between inversely and directly proportional relationships? 	
Enduring Understandings	
<ul style="list-style-type: none"> • Nature of science. • Scientific method • Scientific –Tools/Technology • Lab safety • Use of laboratory instrumentation. 	
Alignment to NJSL-S	
HS-ETS1-1 HS-ETS1-2 HS-ETS1-3	HS-PS1-2-7 HS-ESS3-4
Key Concepts	
<ul style="list-style-type: none"> • Distinguish between characteristics life and the inanimate world. • Interpret scientific investigations using scientific methods. • Define and develop an historical basis for the Scientific Method. • Relate science to current events. • Demonstrate proper and safe lab techniques. • Demonstrate proper use and care of laboratory equipment. 	
Learning Activities	
<ul style="list-style-type: none"> • The Sand Lab • The Paper Clip Lab • Determination of pi • The Line-Determination ($y = mx + b$) Experiment! • Independent Vs. Dependent (Volume and Temperature) Dry Experiment 	
Assessments	
<ul style="list-style-type: none"> • Topic worksheets • Section Quizzes and Tests • Observation Assessment/Lab Activities • Writing Tasks/Lab Reports • Projects/Performing Assessment 	

21st Century Skills

X	Creativity	X	Critical Thinking	X	Communication	X	Collaboration
X	Life and Career Skills	X	Information Literacy	X	Media Literacy		

Interdisciplinary Connections

- Math:
- Social Studies: All Lecture/Discussions Require the Historical Development of the Specific Topic Being Studied.
- Language Arts: There is a writing component to each unit in the form of lab reports. Additionally, each test includes an essay section.
- Fine Arts:

Technology Integration

- PowerPoint Presentations
- Data Projector
- Elmo Incorporation
- DVD/VHS/Disc Demonstration
- YouTube Content Shorts
- Each Class Has 12 Student Computers and the Use of Lap Top Computer Carts
- Microsoft Office Suite 2013
- Integration of Cell Phone Usage by Students to Access Internet During Lecture/Discussions
- All Laboratory Equipment is Technology

Time Frame	2 Weeks	
Topic		
Light Application		
Essential Questions		
<ul style="list-style-type: none"> • What and how does light pollution affect the daily lives of the animals and plants of terrestrial, aquatic and marine environments? • How do different types of electromagnetic radiation affect the lives of people? • Why and how can color keep you safe? • How did the bee follow his nose? 		
Enduring Understandings		
<ul style="list-style-type: none"> • Light can be both beneficial and detrimental to our health. • Trace and define the invention of and uses for the laser. • Light pollution can affect our quality of life. • An incandescent light bulb source is 5% efficient as a light source and 95% efficient as a heat source! 		
Alignment to NJSL-S		
HS-ETS1-1 HS-ETS1-2 HS-ETS1-3	HS-PS1-2-7 HS-ESS3-4	
Key Concepts and Skills		
<ul style="list-style-type: none"> • Describe the dual nature of light and explain how light travels • State what Albert Michelson’s experimental value for the speed of light was. □ State the waves in the electromagnetic spectrum. • Describe why certain materials are transparent to light. • Describe opaque materials. • Describe four light sources other than the vibrations of electrons that produce electromagnetic radiation. • Name four ways lasers are different from other light sources and how lasers work. • Identify uses for lasers in communication, manufacturing, construction, medicine, and business. 		
Learning Activities		
<ul style="list-style-type: none"> • Experiment <ul style="list-style-type: none"> ➤ Flame Test ➤ Spectroscopy • Paper Lab <ul style="list-style-type: none"> ➤ The World at Night ➤ Color Wheels 		
Assessments		
<ul style="list-style-type: none"> • Topic worksheets • Section Quizzes and Tests • Observation Assessment/Lab Activities • Writing Tasks/Lab Reports • Projects/Performing Assessment 		

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Time Frame	2 Weeks
Topic	
Heat, Phase Change, and Thermodynamics	
Essential Questions	
<ul style="list-style-type: none"> • How, what, and why does “The Green House Effect” help to preserve life and threaten to destroy it? • How will alternate energy renewable resources save the planet from destruction? 	
Enduring Understandings	
<ul style="list-style-type: none"> • The understanding of fossil fuels, efficiency, the combustion engine, fuel cells, and entropy will save the planet. • Joseph Black, James Watt, Andrew Derby, coal, steam, engines, and distillation have changed the fortunes of mankind and will possible destroy the world! 	
Alignment to NJSLS-S	
HS-ETS1-1 HS-ETS1-2 HS-ETS1-3	HS-PS1-2-7 HS-ESS3-4
Key Concepts and Skills	
<ul style="list-style-type: none"> • Describe the nature of thermal energy. • Define temperature and distinguish it from thermal energy. • Use the Celsius and Kelvin temperature scales and convert one to the other. • Define specific heat and calculate heat transfer. • Define heats of fusion and vaporization. • State the first and second laws of thermodynamics. • Define heat engine, refrigerator, and heat pump. • Define entropy. • Explain why evaporation of water is a cooling process. • Explain why condensation is a warming process. • Explain why a person with wet skin feels chillier in dry air than in moist air at the same temperature. • Distinguish between evaporation and boiling and explain why food cooked in boiling water takes longer to cook at high altitudes. • Explain why water with substances dissolved in it freezes at a lower temperature than pure water. • Describe how something can boil and freeze at the same time. • Describe how ice melts under pressure and refreezes when the pressure is removed. • Describe how a substance can absorb or release energy with no resulting change in temperature. 	
Learning Activities	
<ul style="list-style-type: none"> • Experiment <ul style="list-style-type: none"> ➤ Determination of the Specific Heat of a Metal. ➤ Melting Point Determination 	

- Boiling Point Determination
- Paper Lab
 - Carnot Efficiency
 - Entropy Analysis

Assessments

- Topic worksheets
- Section Quizzes and Tests
- Observation Assessment/Lab Activities
- Writing Tasks/Lab Reports
- Projects/Performing Assessment

21st Century Skills

X	Creativity	X	Critical Thinking	X	Communication	X	Collaboration
X	Life and Career Skills	X	Information Literacy	X	Media Literacy		

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Time Frame	2 Weeks	
Topic		
Pressure and Climate		
Essential Questions		
<ul style="list-style-type: none"> • How are climates different today relative to before industrialization? • What is the economic impact on regions of the Earth due to dynamic changes in climate? • Is forecasting weather just for planning your next vacation? • The physics involved in the daily activity of the Earth is complex; can humans have much of an impact on Earth’s climates? • What are adaptive features that allow birds to fly long distances? 		
Enduring Understandings		
<ul style="list-style-type: none"> • As the Earth changes as a result of the “interference” of humans, weather patterns around the world will change dynamically. • The future of our civilization will be dependent on our understanding of weather. • The basic concepts of forces and their application were developed in air at about one atmosphere. Air is a fluid. • Newtonian physics developed in air can be applied to all fluids. • The Burj Kalifa and dinosaur birds may hold the answer to saving Earth. 		
Alignment to NJSL-S		
HS-ETS1-1 HS-ETS1-2 HS-ETS1-3		HS-PS1-2-7 HS-ESS3-4
Key Concepts and Skills		
<ul style="list-style-type: none"> • Identify the factors that influence temperature and precipitation. • Explain what causes the seasons. • Explain the theories that have been proposed to explain natural climate change. □ Describe how human activities have affected the ozone layer. • Identify the major types of air masses that affect the weather in North America. • Name and describe the main types of fronts. • Describe measures you can take to ensure safety in a storm. • Identify the causes of flooding. • Explain how the dangers of floods can be reduced. • Explain how technology helps forecasters predict the weather. • Describe the types of information shown on weather maps. • Describe El Nino and its effects. • Explain what happens to energy from the sun when it reaches earth. • Describe how temperature is measured. • Explain the three ways heat is transferred. • Explain what causes winds. • Distinguish between local winds and global winds. • Describe the major global wind belts and where they are located. • Describe how relative humidity is measured. • Describe how precipitation is measured and ways that it might be controlled. 		

- Describe what determines the pressure of a liquid at any point.
- Describe the aneroid barometer.
- Describe the relationship between pressure and density for a given amount of a gas at a constant temperature.
- Explain what determines whether an object will float in air.
- Describe the relationship between the speed of a fluid at any point and the pressure at that point, for steady flow.
- Describe some applications of Bernoulli's principle.

Learning Activities

- Experiment
- Boyle's Law
- Charles' Law
- Gay-Lussac's Law
- Paper Lab
- Water Pressure in the Burj Kalifa, Dubai, UAE ➤ Types of Clouds

Assessments

- Topic worksheets
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Time Frame	4 Weeks		
Topic			
Acid Base Relationships			
Essential Questions			
<ul style="list-style-type: none"> • What is the importance of knowing the difference between acids and bases? • What are some common properties of acids and bases? • What is the pH scale? • What are the long term economical and financial repercussions on increased factory output in Western Europe, China, the North Central United States, and Canada relative to acid precipitation? 			
Enduring Understandings			
<ul style="list-style-type: none"> • Students should study acids and bases because they are important substances in health, industry, and the environment. • Students will be able to identify both acids and bases. • Looking at a pH scale, students will be able to classify solutions as acidic, neutral, or basic. • The Industrial Revolution, coal, Andrew Derby, fossil fuels and combustion are responsible for the destruction of entire terrestrial and aquatic ecosystems. • Scrubbers are influential technology in the reduction of acid precipitation and the revitalization of entire forests. • Two lakes on either side of a mountain are affected very differently by acid precipitation. 			
Alignment to NJSL-S			
HS-ETS1-1 HS-ETS1-2 HS-ETS1-3	HS-PS1-2-7 HS-ESS3-4		
Key Concepts and Skills			
<ul style="list-style-type: none"> • Describe the similarities and differences in physical and chemical properties of acids and bases. • Describe the pH scale. • Describe the nature of a solution based on the pH scale. • Explain the causes of acid precipitation. • Explain how acid precipitation affects plants, soils, and aquatic ecosystems. • Describe three ways that acid precipitation affects humans. • Describe ways that countries are working together to solve the problem of acid precipitation. 			
Learning Activities			
<ul style="list-style-type: none"> • Experiment <ul style="list-style-type: none"> ➤ Buffer Systems: pH versus K_a ➤ Acid-Base Testing in the Kitchen ➤ Neutralization Reaction: $\text{NaOH} + \text{HCl} \longrightarrow \text{NaCl} + \text{HOH}$ • Paper Lab <ul style="list-style-type: none"> ➤ Limnology Study: Acid/Base Determination of a Pond ➤ Titration of Orange Juice: The Titration Curve 			
Assessments			

- Topic worksheets
- Section Quizzes and Tests
- Observation Assessment/Lab Activities
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X	Creativity	X	Critical Thinking	X	Communication	X	Collaboration
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Time Frame	4 Weeks
Topic	
Compounds and Chemicals	
Essential Questions	
<ul style="list-style-type: none"> • How is matter classified? • How do elements, compounds, mixtures differ? • Why can physical methods be used to separate mixtures, but not compounds? • In what state of matter does water have a definite volume but not a definite shape? • What are the chemical and physical properties of matter? • How do the various temperature scales differ? • What are the three basic forms of energy? • How can energy be conserved? • How can students determine the difference between endothermic and exothermic reactions? • What is a calorimeter and how does it determine heats of reactions? • What are chemical reactions and why do they occur? • How can chemical reactions be represented? • How does a balanced chemical equation demonstrate the law of conservation of matter? • What are the four general types of chemical reactions? • What characteristics identify each type of a chemical reaction? 	
Enduring Understandings	
<ul style="list-style-type: none"> • Students should be able to name and describe the four states of matter. • Students will be able to compare and contrast the difference between a pure substance and a mixture. • Learning the difference between homogeneous and heterogeneous mixtures will allow students to describe several techniques to separate mixtures. • Through studying matter, students will be able to compare their chemical and physical properties. • By understanding the various temperature scales, students will be able to conduct various calculations. • Students will demonstrate their understanding of the basic forms of energy and understand the process of energy transformation. • Students will demonstrate the understanding of calorimetry. • Students should be able to describe the characteristics of a chemical reaction. • Students will be able to distinguish between the reactants and the products in a chemical equation. • Having students learn how to properly write a chemical equation will allow them to balance chemical equations and illustrate the law of conservation of matter. 	
Alignment to NJSL-S	
HS-ETS1-1 HS-ETS1-2 HS-ETS1-3	HS-PS1-2-7 HS-ESS3-4
Key Concepts and Skills	
<ul style="list-style-type: none"> • Classify examples of matter as pure substances or mixtures. • Identify the states and the physical and chemical properties of matter. • Given a temperature, calculate a corresponding value on another temperature scale. 	

- Identify energy as either kinetic, potential, or radiant.
- Demonstrate how to convert between different units of energy.
- Describe the difference between endothermic and exothermic chemical reactions.
- Explain the relationship between the heat capacity and the specific heat of a substance.
- Explain how a calorimeter is used to determine the quantity of heat transferred in a chemical reaction.
- Use the energy values to calculate the kilocalories or kilojoules in food.
- Describe the characteristics of a chemical reaction.
- Distinguish between reactants and products.
- Explain how a chemical equation describes what happens in a chemical reaction.
- Write balanced chemical equations.
- Explain how a balanced chemical equation demonstrates the law of conservation of matter.
- Identify a reaction as a synthesis, decomposition, single replacement, double replacement, or combustion.

Learning Activities

- Experiment
 - Determination of **Zn/ZnCl₂**
 - The Production of Magnesium Oxide
 - Formation of a Precipitate: **Pb(NO₃)₂ (aq) + 2NaI (aq) → 2 NaNO₃(aq) + PbI₂(s)**
- Paper Lab
 - Balancing Equations
 - The Mole and the Dulong-Petit Law and Method

Assessments

- Topic worksheets
- Section Quizzes and Tests
- Observation Assessment/Lab Activities
- Writing Tasks/Lab Reports
- Projects/Performing Assessment

21st Century Skills

X	Creativity	X	Critical Thinking	X	Communication	X	Collaboration
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Time Frame	2 Weeks
Topic	
Water	
Essential Questions	
<ul style="list-style-type: none"> • What is a solution? • What properties are used to describe a solution? • How is the concentration of a solution described? • How does a saturated solution differ from a supersaturated solution? • What is solubility? • What factors affect the rate of dissolving? • How do you interpret a solubility curve? • What is an electrolyte and nonelectrolytes? • What are colligative properties? • Why is water the universal solvent? • When a lake freezes do the fish die? • Why doesn't Lake Tahoe freeze...ever? 	
Enduring Understandings	
<ul style="list-style-type: none"> • Concrete is held together by water. • Like dissolves like. • Road crews put sodium chloride on the road in the winter and sometime calcium salts. □ Water does not conduct electricity. • Diamonds are called ice and ice resembles diamonds...the hydrogen bond and the tetrahedron. • Water is the universal solvent. • The human body is 60% water; the human brain is 80% water and the Earth's surface is 75% water. • The unique properties of water cause hurricanes, erode mountains, puts out fires, sustains life and dissolves most salts. 	
Alignment to NJSL-S	
HS-ETS1-1 HS-ETS1-2 HS-ETS1-3	HS-PS1-2-7 HS-ESS3-4
Key Concepts and Skills	
<ul style="list-style-type: none"> • Describe the properties of solution. • Identify the different types of solutions. • Define solute and solvent. • Measure the concentration of solutions in terms of molarity, molality, and mole fraction. • Differentiate among saturated, unsaturated, and supersaturated solutions. • Explain how solutions form. • Define solubility and describe the factors that affect solubility. • Describe the factors that affect the rate at which a solute dissolves in a solvent. • Interpret a solubility curve. • Identify solutes as electrolytes or nonelectrolytes. • Explain the meaning of a colligative property of a solution • Explain the meaning of boiling point elevation and freezing point depression. • Using the formulas for boiling point elevation and freezing point depression, students will calculate the new boiling point a freezing point of a solution. 	
Learning Activities	

- Experiment
- The Electrolysis Water: $2\text{H}_2\text{O} (\text{l}) \longrightarrow 2\text{H}_2 (\text{g}) + \text{O}_2 (\text{g})$
- Water: The Universal Solvent
- Electrolytes and Nonelectrolytes
- Paper Lab
- Freezing Point Determination and Freezing Point Depression of Water
- Boiling Point Determination and Boiling Point Elevation of Water

Assessments

- Topic worksheets
- Section Quizzes and Tests
- Observation Assessment/Lab Activities
- Writing Tasks/Lab Reports
- Projects/Performing Assessment

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Time Frame	2 Weeks
Topic	
Health: Food Science, Agriculture, and Nutrition	
Essential Questions	
<ul style="list-style-type: none"> • What are the relationships among global warming, worldwide climatic changes, the melting of the glaciers, famine, poverty, and malnutrition? • How does farming affect the health of our oceans? • What is the connection among water, famine, disease, and sewage treat? • Even though the life expectancy has doubled in the last 150 years because of clean water and sewage treatment, what will the next 150 years bring? Will we progress or regress? • London cured a cholera epidemic in the mid-19th century 40 years before germ theory, how and what is the relationship among clean water, nutrition, and agriculture? • Is the “new” swine flu (H1N1) part of “The Coming Plague: Newly Emerging Diseases in a “World out of Balance” as written by Laurie Garret? • How will the world politic change when the mountain glaciers (especially in the Himalayas) melt and are gone? 	
Enduring Understandings	
<ul style="list-style-type: none"> • [Joseph Bazalgette (1819 - 1891)] • The point of agriculture is to produce food. Food science helps to ensure the quality and abundance of food. Food helps to provide nutrition. Good nutrition hopefully boosts the immune system. A good immune system prevents disease. Get rid of disease and increase the length and quality of life. 	
Alignment to NJSL-S	
HS-ETS1-1 HS-ETS1-2 HS-ETS1-3	HS-PS1-2-7 HS-ESS3-4
Key Concepts Skills	
<ul style="list-style-type: none"> • Identify the major causes of foods malnutrition. • Describe the bomb calorimeter and describe how it is used to determine the caloric content of food. • Trace and define the role of nutritional supplements in nutrition • Compare the environmental costs of producing different types of food. • Explain how poverty is a major cause of malnutrition. • Define and trace the link between global warming and drought and its effect on farming and nutrition. • Explain the importance of the green revolution. • Distinguish between traditional and modern agricultural techniques. • Describe fertile soil and the need for soil conservation. • Explain the benefits and environmental impacts of pesticide use. • Explain how genetic engineering is used in agriculture. • Explain how overharvesting affects the supply of aquatic organisms used for foods. • Describe the current role of aquaculture in providing seafood. • Describe the importance of livestock in providing food and other products. 	
Learning Activities	

- Experiment
 - Determination of the Caloric Content of Captain Crunch™
 - Hydrolysis of Ascorbic Acid (Vitamin C)
- Paper Lab
 - RDA and the Nutrition of Cereal
 - “Name that Vitamin”

Assessments

- Topic worksheets
- Section Quizzes and Tests
- Observation Assessment/Lab Activities
- Writing Tasks/Lab Reports
- Projects/Performing Assessment

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