

## HIGH SCHOOL PHYSICAL SCIENCE

## CAPE MAY COUNTY NEW JERSEY

(2010)

OBJECTIVE CODE			UNIT CONTENT & PACING	UNIT ESSENTIAL QUESTIONS	UNIT ENDURING UNDERSTANDING WHAT STUDENTS SHOULD KNOW AND BE ABLE TO DO	DIFFERENTIATED ACTIVITIES Tier 1, 2, 3	BENCHMARK ASSESSMENTS
Grade	Standard	Strand					
9	5.2	12.A.1	Chemistry	What is the structure of an atom?	Use atomic models to predict the behaviors of atoms in interactions	1. Building atomic models with various materials	<a href="http://www.sciencegeek.net/Chemistry/taters/directory.shtml">http://www.sciencegeek.net/Chemistry/taters/directory.shtml</a>
9	5.2	12.A.2	Chemistry	What is matter? What determines the various states of matter?	Account for the differences in the physical properties of solids, liquids and gases	1. Use heat to change H <sub>2</sub> O into its three phases	<a href="http://www.sciencegeek.net/Chemistry/taters/directory.shtml">http://www.sciencegeek.net/Chemistry/taters/directory.shtml</a>
9	5.2	12.A.3	Chemistry	How are elements classified and organized?	Predict the placement of unknown elements on the Periodic Table based on their physical and chemical properties	1. Provide physical properties of elements and place them in the periodic table to show trends	<a href="http://www.sciencegeek.net/Chemistry/taters/directory.shtml">http://www.sciencegeek.net/Chemistry/taters/directory.shtml</a>
9	5.2	12.A.4	Chemistry	What is an isotope and how are the properties of isotopes relevant to modern applications?	Explain how the properties of isotopes, including half-lives, decay modes, and nuclear resonances, lead to useful applications of isotopes	Use groups of differently weighted pennies (pre and post 1987) to describe isotopes  renewable projects – Fusion and Fission project - <a href="http://www1.eere.energy.gov/biomass/pdfs/highschool_projects.pdf">http://www1.eere.energy.gov/biomass/pdfs/highschool_projects.pdf</a> Radioactive decay – Radioactive decay simulations - <a href="http://www.colorado.edu/physics/2000/isotopes/radioactive_decay3.html">http://www.colorado.edu/physics/2000/isotopes/radioactive_decay3.html</a> - <a href="http://www.webelements.com/">http://www.webelements.com/</a> - go to properties and see decays  atom builder - <a href="http://www.pbs.org/wgbh/aso/tryit/atom/">http://www.pbs.org/wgbh/aso/tryit/atom/</a> -	<a href="http://www.sciencegeek.net/Chemistry/taters/directory.shtml">http://www.sciencegeek.net/Chemistry/taters/directory.shtml</a>
9	5.2	12.A.5	Chemistry	What are the properties of a solution? How is the concentration of a solution determined?	Describe the process by which solutes dissolve in solvents	Some solution examples - <a href="http://www.princeton.edu/~pccm/outreach/scsp/mixturesandsolutions/toc_full.htm">http://www.princeton.edu/~pccm/outreach/scsp/mixturesandsolutions/toc_full.htm</a> Green chemistry and application - <a href="http://teachers.yale.edu/curriculum/search/viewer.php?id=initiative_09.05.01_u">http://teachers.yale.edu/curriculum/search/viewer.php?id=initiative_09.05.01_u</a> Full Activity lesson with materials on solutions - <a href="http://dwb4.unl.edu/Chem/CHEM869A/CHEM869AMats/Molarity.pdf">http://dwb4.unl.edu/Chem/CHEM869A/CHEM869AMats/Molarity.pdf</a>  Lab – ornaments out of borax – pipe cleanings concentration concepts	<a href="http://www.sciencegeek.net/Chemistry/taters/directory.shtml">http://www.sciencegeek.net/Chemistry/taters/directory.shtml</a>

						Electrolytic properties of water – distilled vs. salt water concentration - % of salt in salt water – boil of/ evaporate water and measure residue see also <a href="http://www.discovery.education.com">www.discovery.education.com</a> Teaching molarity - <a href="http://employees.oneonta.edu/viningwj/sims/compounds_molecules_moles_s.html">http://employees.oneonta.edu/viningwj/sims/compounds_molecules_moles_s.html</a> and	
9	5.2	12.A.6	Chemistry	What is the difference between an acid and a base?	Relate the pH scale to the concentrations of various acids and bases	pH – pinelands  Household Survey of materials - assemble groups of household acids and bases, and categorize using litmus paper or other indicators such as bromothymol blue or red cabbage <a href="http://www.funsci.com/fun3_en/acids/acids.htm">http://www.funsci.com/fun3_en/acids/acids.htm</a> <a href="http://www.nclark.net/AcidsBases">http://www.nclark.net/AcidsBases</a> <a href="http://www.chem.uwec.edu/Chem352_S10/pages/elaborations/acids-bases/a_operational.html">http://www.chem.uwec.edu/Chem352_S10/pages/elaborations/acids-bases/a_operational.html</a>  using conductivity to teach pH - <a href="http://www.watercampws.uiuc.edu/waterclear/labs/lessons/titration_teacher_guide.pdf">http://www.watercampws.uiuc.edu/waterclear/labs/lessons/titration_teacher_guide.pdf</a>	<a href="http://www.sciencegeek.net/Chemistry/taters/directory.shtml">http://www.sciencegeek.net/Chemistry/taters/directory.shtml</a>
9	5.2	12.B.1	Chemistry	What is the difference between an atom and a compound? How do atoms interact?	Model how the outermost electrons determine the reactivity of elements and the nature of the chemical bonds they tend to form	Use Hoffman Apparatus to break apart water molecules into hydrogen and oxygen. Analyze different volumes of gas obtained. Blow up the hydrogen collected in a SMALL cardboard juice or milk container	<a href="http://www.sciencegeek.net/Chemistry/taters/directory.shtml">http://www.sciencegeek.net/Chemistry/taters/directory.shtml</a>
9	5.2	12.B.2	Chemistry	What happens when electrons are transferred between substances?	Describe oxidation and reduction reactions, and give examples of oxidation and reduction reactions that have an impact on the environment, such as corrosion and the burning of fuel	WebQuest – chemical reactions Zunal.com Perform demonstrations of reactions – sugar in sulfuric acid, etc.	<a href="http://www.sciencegeek.net/Chemistry/taters/directory.shtml">http://www.sciencegeek.net/Chemistry/taters/directory.shtml</a>
9	5.2	12.B.3	Chemistry	How does the Law of Conservation of Mass influence the amount of reactants and products in a reaction?	Balance chemical equations by applying the law of conservation of mass	1. Balancing chemical equations in groups  2. Baking soda and vinegar. 3 Parts <ol style="list-style-type: none"> <li>1. Beaker, 30ml vinegar, tissue wrapped baking soda. Find mass of all parts at same time. Drop baking soda packet into vinegar. Find mass of whole apparatus again. (Should be less)</li> <li>2. Repeat same steps using a bottle that can be sealed. (Mass should be same)</li> <li>3. Repeat same steps with a flask. Instead of a cap use a balloon to top the flask. The carbon dioxide will be caught in the balloon which allows the students to see where the "lost" mass went in step 1.</li> </ol>	<a href="http://www.sciencegeek.net/Chemistry/taters/directory.shtml">http://www.sciencegeek.net/Chemistry/taters/directory.shtml</a>

9	5.2	12.C.1	Chemistry	What factors influence states of matter? Why is no reaction 100% efficient?	Use the kinetic molecular theory to describe and explain the properties of solids, liquids and gases	Virtual Labs What factors influence the pressure of a gas in a container? <a href="http://www.science-class.net/chemistry/states.htm">www.science-class.net/chemistry/states.htm</a> Density Labs Chemical Reactions that produce heat and light	<a href="http://www.sciencegeek.net/Chemistry/taters/directory.shtml">http://www.sciencegeek.net/Chemistry/taters/directory.shtml</a>
9	5.2	12.C.2	Chemistry	Why don't all substances have the same melting and boiling points?	Account for any trends in the melting points and boiling points of various compounds	1.M&M's history 2. Take a small amount of salt and place it on a hot plate. At the same time place the same amount of sugar on another hot plate. This can show the differences in melting points for ionic and covalent bonds. 3.History of wood fires and coal fires and the ability to melt iron.	<a href="http://www.sciencegeek.net/Chemistry/taters/directory.shtml">http://www.sciencegeek.net/Chemistry/taters/directory.shtml</a>
9	5.2	12.D.1	Physics (Motion and Forces)	What is the relationship between potential and kinetic energy?	Model the relationship between the height of an object and its potential energy	1. predict and test the speed of the same Matchbox car released from a ramp of varying heights 2. Online Projectile Motion Activity <a href="http://teachersdomain.org">teachersdomain.org</a> 3. Powergrids on video games 4. Rollercoaster 5.Pendulum hanging from the ceiling, dare to stay still after releasing it.	<a href="http://www.sciencegeek.net/Chemistry/index.shtml">http://www.sciencegeek.net/Chemistry/index.shtml</a>
9	5.2	12.D.2	Chemistry	How does heat energy flow from one substance to another? How is this concept used in everyday life?	Describe the potential commercial applications of exothermic and endothermic reactions	1.Examine hot compresses and cold packs and determine how they work 2. Ice water and warm water on your hand air conditioners and heat pumps	<a href="http://www.sciencegeek.net/Chemistry/taters/directory.shtml">http://www.sciencegeek.net/Chemistry/taters/directory.shtml</a>
9	5.2	12.D.3	Chemistry/ Earth Science	What is the difference between fission and fusion?	Describe the products and potential applications of fission and fusion reactions	1. Determine where the sun's energy comes from-relate to the fission of helium atoms to hydrogen 2. Determine how the power of atomic bombs of Hiroshima and Nagasaki come from  renewable projects - <a href="http://www1.eere.energy.gov/biomass/pdfs/highschool_projects.pdf">http://www1.eere.energy.gov/biomass/pdfs/highschool_projects.pdf</a>  trip to Pluto - <a href="http://www.pbs.org/wgbh/nova/teachers/activities/3213_einstein_05.html">http://www.pbs.org/wgbh/nova/teachers/activities/3213_einstein_05.html</a>  lesson about F & F - <a href="http://www.paec.org/progressenergygrant/nuclear_energy_transformed.pdf">http://www.paec.org/progressenergygrant/nuclear_energy_transformed.pdf</a>  <a href="http://fusedweb.llnl.gov/CPEP/">http://fusedweb.llnl.gov/CPEP/</a> - all about fusion <a href="http://alsos.wlu.edu/">http://alsos.wlu.edu/</a> - research digital library <a href="http://www.nclark.net/NuclearChem">http://www.nclark.net/NuclearChem</a> - nuclear chemistry	<a href="http://www.sciencegeek.net/Chemistry/taters/directory.shtml">http://www.sciencegeek.net/Chemistry/taters/directory.shtml</a>
9	5.2	12.D.4	Physics (Motion)	How is momentum	Measure quantitatively the energy transferred between objects during a collision	1. Car crashes, billiards, air tracks 2. Marble collisions	<a href="http://www.sciencegeek.net/Chemistry/index.shtml">http://www.sciencegeek.net/Chemistry/index.shtml</a>

			and Forces)	conserved in collisions?			<a href="#">html</a>
9	5.2	12.D.5	Chemistry	What factors influence the rates of chemical reactions?	Model the change in rate of a reaction by changing a factor	1. Preservatives, making water boil faster using salt or boiling sticks, enzyme liver lab, boiling different pastas to show how surface area will increase reaction rates.	<a href="http://www.sciencegeek.net/Chemistry/taters/directory.shtml">http://www.sciencegeek.net/Chemistry/taters/directory.shtml</a>
9	5.2	12.E.1	Physics (Forces and Motion)	How is the motion of an object described mathematically?	Compare the calculated and measured speed, average speed, and acceleration of an object in motion, and account for differences that may exist between calculated and measured values	How fast are you really? Lab Calculate the velocity and acceleration of many different animals then calculate your own velocity and acceleration to see what animal you are closest to.	<a href="http://www.sciencegeek.net/Physics/index.shtml">http://www.sciencegeek.net/Physics/index.shtml</a>
9	5.2	12.E.2	Physics (Forces and Motion)	What are the different types of motion?	Compare the translational and rotational motions of a thrown object and potential applications of this understanding	<a href="http://www.wfu.edu/physics/demolabs/demos/avimov/bychptr/chptr_1motion.html">www.wfu.edu/physics/demolabs/demos/avimov/bychptr/chptr_1motion.html</a>	<a href="http://www.sciencegeek.net/Physics/index.shtml">http://www.sciencegeek.net/Physics/index.shtml</a>
9	5.2	12.E.3	Physics (Forces and Motion)	How does mass and velocity influence motion? Why do seatbelts save lives?	Create simple models to demonstrate the benefits of seatbelts using Newton's first law of motion	Law of conservation of momentum lab and inertia. Table cloth pull: a competition to see who can keep more objects on the table.	<a href="http://www.sciencegeek.net/Physics/index.shtml">http://www.sciencegeek.net/Physics/index.shtml</a>
9	5.2	12.E.4	Physics (Forces and Motion)	How do unbalanced forces influence motion?	Measure and describe the relationship between the force action on an object and the resulting acceleration	1. Discuss why it is so hard for trains to stop even though they move slower than cars 2. have two students pull with equal force on ropes attached to a spring scale to see zero net force (tug of war) 3. free body diagrams	<a href="http://www.sciencegeek.net/Physics/index.shtml">http://www.sciencegeek.net/Physics/index.shtml</a>

## High School Core Vocabulary Lists

### Science Practices Vocabulary

Scientific Method, observation, inference, data, qualitative, quantitative, generalize, conclude, hypothesis, theory, variable, measure, evidence, infer, compare, predict, interpret, analyze, relate, calculate, observe, describe, classify, technology, experiment, investigation, tentative, assumption, ethical, validity, precision, accuracy, skeptical, independent variables, dependent variables, control, constant

### Chemistry Vocabulary

atom, element, nucleus, proton, neutron, electron, isotope, metal, nonmetal, metalloid, malleable, conductive, periodic table, quanta, wavelength, radiation, emit, absorb, spectrum, half-life, fission, fusion, energy level, mole, chemical property, physical property, compound, valence electrons, ionic, covalent, malleability, conductivity, solubility, intermolecular, polarity, chemical reaction, matter, law of conservation of mass, law of conservation of energy, temperature, electrochemical cell, entropy, chemical equation, endothermic, exothermic, heat, rate, catalyst, concentration, collision theory, equilibrium, half reaction solution, solute, solvent, concentration, molarity, percent concentration, colligative property, boiling point, freezing point, acid, base, pH, indicator, titration, hydrogen ion, neutralization, parts per million, concentrated, dilute, dissolve

### Physics Vocabulary

position, time, speed, velocity, acceleration, distance, displacement, rate, instantaneous velocity, average velocity, frame of reference, balanced forces force, electric force, electric charge, friction, gravitational force, mass, net force, normal force, weight, vector, vector diagram energy, potential energy, kinetic energy, law of conservation of energy, wave, mechanical wave, electromagnetic wave, electromagnetic spectrum, wavelength, frequency, amplitude, period, reflection, refraction, diffraction, Doppler effect, elastic potential energy, medium, radio wave, microwave, infrared, visible light, ultraviolet, x-ray, gamma ray, conduction, convection, radiation

## SHOULD BE EDITED BY CONTENT SPECIFIC SCIENCE TEACHERS

(Essential Questions should be worded so that a high school student can read and answer. The kind of question that could be written on the board to act as ANTICIPATORY SET.)

**Links to Benchmark Assessments for Chemistry, Biology, and Physics. To use Science Geek, scroll through the “select your destination” section and there are labs, and cumulative reviews.**

<http://www.sciencegeek.net/Chemistry/taters/directory.shtml>

<http://www.sciencegeek.net/Biology/index.shtml>

[http://www.sciencegeek.net/C\\_Physics/index.shtml](http://www.sciencegeek.net/C_Physics/index.shtml)