

Middle Township High School
Curriculum/Pacing Guide 2011-12
Biology

Content	CPI	Pacing (when & how long)	Assessment (Benchmark)
<p><i>Science Practices</i></p> <ol style="list-style-type: none"> 1) Mathematical, physical, and computational tools are used to search for and explain core scientific concepts and principles. 2) Logically designed investigations are needed in order to generate evidence required to build and refine models and explanations. 3) Refinement of understandings, explanations, and models occur as new evidence is incorporated. 4) Science involves practicing productive social interaction with peers such as partner talk, whole group discussion, and small group work. 	<p>5.1.12.A.1</p> <p>5.1.12.B1</p> <p>5.1.12.C1</p> <p>5.1.12.D1</p>	<p>September through June (woven throughout content)</p>	<p>Science Fair</p> <p>Lab reports</p> <p>Experiments</p> <p>Group Projects</p>

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<i>A. Organization and Development</i>			
1) Cells are made up of complex molecules that consist mostly of a few elements. Each class of molecules has its own building blocks and specific functions.	5.3.12.A1	2 weeks	Human Diet Analysis Presentation
2) Cellular processes are carried out by many different types of molecules, mostly by the group of proteins known as enzymes.	5.3.12.A2	2 weeks	Enzyme Lab
3) Cellular function is maintained through the regulation of cellular processes in response to internal and external conditions.	5.3.12.A3	2 weeks	Egg Osmosis Lab
4) Cells divide through the process of mitosis producing daughter cells that have the same genetic composition as the original cell.	5.3.12.A4	2 weeks	Create a video demonstrating the developmental changes in a fertilized egg
5) Cell differentiation is regulated through the expression of different genes during the development of complex multicellular organisms.	5.3.12.A5	2 weeks	
6) There is a relationship between the organization of cells into tissues and the organization of tissues into organs. The structure and function of organs determine their relationships in the body system of an organism.	5.3.12.A6	1 week	Stem Cell research Debate

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<p><i>B. Matter and Energy Transformations</i></p> <ol style="list-style-type: none"> 1) As matter cycles and energy flows through different levels of organization within living systems (cells,organs,organisms,communities) and between living systems and the physical environment. Chemical elements are recombined into different products. 2) Each recombination of matter and energy results in the storage and dissipation of energy into the environment as heat. 3) Continual input of energy from sunlight keeps matter and energy flowing through ecosystems. 4) Plants have the capability to take energy from light to form sugar molecules containing carbon, hydrogen, and oxygen. 5) In both plants and animal cells sugar is a source of energy and can be used to create other carbon containing molecules (organic). 6) All organisms must break the high energy chemical bonds in food molecules during cellular respiration to obtain the energy needed for life's processes. 	<p>5.3.12.B1</p> <p>5.3.12.B2</p> <p>5.3.12.B3</p> <p>5.3.12.B4</p> <p>5.3.12.B5</p> <p>5.3.12.B6</p>	<p>1 week</p> <p>1 week</p> <p>1 week</p> <p>1 week</p> <p>1 week</p> <p>1 week</p>	<p>Composting Project</p> <p>Debate Pros and Cons of vegetarian diet</p> <p>Research proposal explaining the importance of ecosystems</p> <p>Elodea Photosynthesis Lab</p> <p>Create documentary comparing cell respiration to the burning of fossil fuels</p>
<p><i>C. Interdependence</i></p> <ol style="list-style-type: none"> 1) Biological communities in ecosystems are based on stable interrelationships and interdependence of organisms. 2) Stability in an ecosystem can be disrupted by natural or human interactions. 	<p>5.3.12.C.1</p> <p>5.3.12.C.2</p>	<p>2 weeks</p> <p>1 week</p>	<p>Marsh Project/Human Impact</p> <p>Create Food Web and associated Trophic level pyramid for local ecosystem</p>

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<p><i>D. Heredity and Reproduction</i></p> <ol style="list-style-type: none"> 1) Genes are segments of DNA molecules located in the chromosomes of each cell. DNA molecules contain genetic information that determine a sequence of amino acids, which result in the production of specific proteins. 2) Inserting, deleting, or substituting DNA segments can alter the genetic code. An altered gene may be passed on to every cell that develops from it. The resulting features may help, harm, or have little or no effect on the offspring's success in its environment. 3) Sorting and recombination of genes in sexual reproduction result in a great variety of possible gene combinations in the offspring of any two parents. 	<p>5.3.12.D.1</p> <p>5.3.12.D.2</p> <p>5.3.12.D.3</p>	<p>2 weeks</p> <p>2 weeks</p> <p>2 weeks</p>	<p>Investigate and Observe DNA from organic material.</p> <p>Monohybrid and Dihybrid crosses</p> <p>Investigate color blindness in Drosophila</p> <p>Genetic Disorder Research Paper/Pamphlet</p>
<p><i>E. Evolution and Diversity</i></p> <ol style="list-style-type: none"> 1) New traits may result from new combinations of existing genes or from mutations of genes in reproductive cells within a population. 2) Molecular evidence (e.g., DNA, protein structures, etc.) substantiates the anatomical evidence for evolution and provides additional detail about the sequence in which various lines of descent branched. 3) The principles of evolution (including natural selection and common descent) provide a scientific explanation for the history of life on Earth as evidenced in the fossil record and in 	<p>5.3.12.E.1</p> <p>5.3.12.E.2</p> <p>5.3.12.E.3</p>	<p>2 weeks</p> <p>1 week</p> <p>2 weeks</p>	<p>Evolution / Natural Selection Webquest</p> <p>Explore and Summarize Peppered Moth Case Study</p> <p>Use available anatomical and molecular evidence</p>

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the similarities that exist within the diversity of existing organisms.			to construct a cladogram.
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Chemistry

Content	CPI	Pacing (When and how long)	Assessment (Benchmark)
<p><i>Science Practices</i></p> <ol style="list-style-type: none"> 1. Mathematical, physical, and computational tools are used to search for and explain core scientific concepts and principles. 2. Logically designed investigations are needed in order to generate evidence required to build and refine models and explanations. 3. Refinement of understandings, explanations and models occur as new evidence is incorporated. 4. Science involves practicing productive social interaction with peers such as partner talk, whole group discussion and small group work. 	<p>5.1.12.A1</p> <p>5.1.12.B1</p> <p>5.1.12.C1</p> <p>5.1.12.D1</p>	<p>September through June (woven throughout content)</p>	<p>Science Fair</p> <p>Lab Reports</p> <p>Experiments</p> <p>Group Projects</p>
<p><i>A. Properties of Matter</i></p> <ol style="list-style-type: none"> 1. Electrons, protons and neutrons are parts of the atom and have measurable properties, including mass and, in the case of protons and electrons, charge. The nuclei of atoms are composed of protons and neutrons. A kind of force that is only evident at nuclear distances holds the particles of the nucleus together against the electrical repulsion between the protons. 2. Differences in the physical properties of solids, liquids, and gases are explained by the ways in which the atoms, ions or molecules of the substances are arranged, and by the strength of 	<p>5.2.12.A1</p> <p>5.2.12.A2</p>	<p>2-3 Weeks</p> <p>1 Week</p>	<p>Element Project - determines how elements are grouped together</p> <p>Investigation into the location of electrons</p> <p>Computer lab with solutions</p>

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<p>the forces of attraction between the atoms, ions or molecules</p>	5.2.12.A3	2 Weeks	
<p>3. In the Periodic table, elements are arranged according to the number of protons (atomic number). This organization illustrates commonality and patters of physical and chemical properties among the elements.</p>	5.2.12.A4	1-2 Weeks	Borax lab - making crystals from a supersaturated solution
<p>4. In a neutral atom, the positively charged nucleus is surrounded by the same number of negatively charged electrons. Atoms of an element whose nuclei have different numbers of neutrons are called isotopes.</p>	5.2.12.A5	2 Weeks	Titration lab
<p>5. Solids, liquids, and gases may dissolve to form solutions. When combining a solute and solvent to prepare a solution, exceeding a particular concentration of solute will lead to precipitation of the solute from the solution. Dynamic equilibrium occurs in saturated solutions. Concentration of solutions can be calculated in terms of molarity, molality and percent by mass.</p>	5.2.12.A6	3 Weeks	
<p>6. Acids and bases are important in numerous chemical processes that occur around us, from industrial to biological processes, from the lab to the environment.</p>			

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<p>B. Changes in Matter</p> <ol style="list-style-type: none"> 1. An atom's electron configuration, particularly of the outermost electrons, determines how the atom interacts with other atoms. Chemical bonds are the interactions between atoms that hold them together in molecules or between oppositely charged ions. 2. A large number of important reactions involve the transfer of either electrons or hydrogen ions between reacting ions, molecules, or atoms. In other chemical reactions, atoms interact with one another by sharing electrons to create a bond. 3. The conservation of atoms in chemical reactions leads to the ability to calculate the mass of products and reactants using the mole concept. 	<p>5.2.12.B1</p> <p>5.2.12.B2</p> <p>5.2.12.B3</p>	<p>2 weeks</p> <p>3 Weeks</p> <p>1-2 Weeks</p>	<p>Element Spectra Emission Lab</p> <p>Investigation into the difference between ionic and covalent bonds</p> <p>Bonding Writing Assignment</p>
<p>C. Forms of Energy</p> <ol style="list-style-type: none"> 1. Gas particles move independently and are far apart relative to each other. The behavior of gases can be explained by the kinetic molecular theory. This theory can be used to explain the relationship between pressure and volume, volume and temperature, pressure and temperature, and the number of particles in a gas sample. There is a natural tendency for a system to move in the direction of disorder or entropy. 2. Heating increases the energy of the atoms composing elements and the molecules or ions 	<p>5.2.12.C1</p> <p>5.2.12.C2</p>	<p>2 Weeks</p> <p>1 Week</p>	<p>Gas Laws Webquest</p> <p>Charles's Law Computer Lab</p>

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<p>composing compounds. As the kinetic energy of the atoms, molecules, or ions increases, the temperature of the matter increases. Heating a pure solid increases the vibrational energy of its atoms, molecules, or ions. When the vibrational energy of the molecules of a pure substance becomes great enough, the solid melts.</p>			
<p>D. Energy Transfer and Conservation</p> <ol style="list-style-type: none"> 1. The driving forces of chemical reactions are energy and entropy. Chemical reactions either release energy to the environment (exothermic) or absorb energy from the environment (endothermic). 2. Nuclear reactions (fission and fusion) convert very small amounts of matter into energy. 3. Chemical equilibrium is a dynamic process that is significant in many systems, including biological, ecological, environmental, and geological systems. Chemical reactions occur at different rates. Factors such as temperature, mixing, concentration, particle size, and surface area affect the rate of chemical reactions. 	<p>5.2.12.D2</p> <p>5.2.12.D3</p> <p>5.2.12.D5</p>	<p>2-3 Weeks</p> <p>1 Week</p> <p>2-3 Weeks</p>	<p>Lab involving reversible reactions</p> <p>Investigation into how reaction rates are affected</p>

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Environmental Science

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<p>Matter and Energy Transformations</p> <p>1) As matter cycles and energy flows through different levels of organization within living systems, and between living systems and the physical environment, chemical elements are recombined into different products.</p> <p>2) Each recombination of matter and energy results in storage and dissipation of energy into the environment as heat.</p> <p>3) Continual input of energy from sunlight keeps matter and energy flowing through ecosystems.</p>	<p>5.3.12.B.1</p> <p>5.3.12.B.2</p> <p>5.3.12.B.3</p>	<p>2 weeks</p> <p>2 weeks</p> <p>2 weeks</p>	<p>Bio-magnification Poster Project</p> <p>The real Mad Hatter</p> <p>Salt Marsh Food Web</p>
<p>Biogeochemical Cycles</p> <p>1) Natural and human-made chemicals circulate with water in the hydrologic cycle.</p> <p>2) Natural ecosystems provide an array of basic functions that affect humans. These functions include maintenance of the quality of the atmosphere, generation of soils, control of the hydrologic cycle, disposal of wastes, and recycling of nutrients.</p> <p>3) Movements of matter through Earth's system is driven by Earth's internal and external sources of energy and results in changes in the physical and chemical properties of matter.</p>	<p>5.4.12.G.1</p> <p>5.4.12.G.2</p> <p>5.4.12.G.3</p>	<p>2 weeks</p> <p>3 weeks</p> <p>2 weeks</p>	<p>Local Watershed Investigation</p> <p>Chemistry of Estuarine Water of Cape May County</p> <p>“Tragedy of the Commons”</p> <p>Life and Death of a Coral Reef</p>

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<p>4) Natural and human activities impact the cycling of matter and flow through the ecosystems.</p> <p>5) Human activities have changed Earth’s land, oceans, and atmosphere, as well as it’s populations of plant and animal species.</p> <p>6) Scientific, economic, and other data can assist in assessing environmental risks and benefits associated with societal activity.</p> <p>7) Earth is a system in which chemical elements exist in fixed amounts and move through the solid Earth, oceans, atmosphere, and living things as part of geochemical cycles.</p>	<p>5.4.12.G.4</p> <p>5.4.12.G.5</p> <p>5.4.12.G.6</p> <p>5.4.12.G.7</p>	<p>3 weeks</p> <p>Woven throughout curriculum</p> <p>4 weeks</p> <p>4 weeks</p>	<p>Global Warming Debate</p> <p>Rooftop Garden Poster Session</p> <p>Ethnobotany Research</p> <p>Cape May County Stream Network Map Production</p>
<p>Climate and Weather</p> <p>1) Climate is determined by energy transfer from the Sun at and near the Earth’s surface. This energy transfer is influenced by dynamic processes, such as cloud cover and Earth’s rotations, as well as static conditions, such as proximity to mountain ranges and the ocean.</p> <p>2) Human activities, such as the burning of fossil fuels, also affect the global climate.</p>	<p>5.4.12.F.2</p> <p>5.4.12.F.2</p>	<p>3 weeks</p> <p>3 weeks</p>	<p>Global Warming Rally</p> <p>Carbon Footprint Calculation</p> <p>“Global Taco” Project</p>

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<p>Properties of Earth Materials</p> <p>1) Soils are at the interface of the Earth systems, linking together the biosphere, geosphere, atmosphere, and hydrosphere.</p> <p>2) The chemical and physical properties of the vertical structure of the atmosphere support life on Earth.</p>	<p>5.4.12.C.1</p> <p>5.4.12.C.2</p>	<p>3 weeks</p> <p>2 weeks</p>	<p>Vermiculture Project</p> <p>Local Soil Testing</p> <p>Compost Project</p>
<p>Science Practices</p> <p>5) Mathematical, physical, and computational tools are used to search for and explain core scientific concepts and principles.</p> <p>6) Logically designed investigations are needed in order to generate evidence required to build and refine models and explanations.</p> <p>7) Refinement of understandings, explanations, and models occur as new evidence is incorporated.</p> <p>8) Science involves practicing productive social interaction with peers such as partner talk, whole group discussion, and small group work.</p>	<p>5.1.12.A.1</p> <p>5.1.12.B1</p> <p>5.1.12.C1</p> <p>5.1.12.D1</p>	<p>September through June (woven throughout content)</p>	<p>Science Fair</p> <p>Lab reports</p> <p>Experiments</p> <p>Group Projects</p>

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Physics

Content	CPI	Pacing (when & how long)	Assessment (Benchmark)
I. Science Practices			
9) Mathematical, physical, and computational tools are used to search for and explain core scientific concepts and principles.	5.1.12.A.1	September through June (woven throughout content)	Science Fair
10) Logically designed investigations are needed in order to generate evidence required to build and refine models and explanations.	5.1.12.B1		Lab reports
11) Refinement of understandings, explanations, and models occur as new evidence is incorporated.	5.1.12.C1		Experiments
12) Science involves practicing productive social interaction with peers such as partner talk, whole group discussion, and small group work.	5.1.12.D1		Group Projects
II. Science Practices (Application)			
1) Logically designed investigation are needed in order to generate the evidence required to build and refine models and explanations.	5.1.12.B1	6 weeks	Calorimetry lab
2) Refinement of understandings, explanations, and models occur as new evidence is incorporated.	5.1.12.C1		Current Lab
3) Data and refined models are used to revise predictions and explanations.	5.1.12.C2		Doppler shift investigation and presentation
4) Science involves using language, both oral and written, as a tool for making thinking public,	5.1.12.D2		Resonance lab
			Scientific method lab
			Mousetrap Competition
			Vector Activity
			Equilibrium investigation with

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			mobiles
<p>II. Properties of Matter</p> <p>1) Differences in the physical properties of solids, liquids, and gasses are explained by the ways in which atoms, ions, or molecules of the substance are arranged, and by the strength of the forces of attraction between the atoms, ions, or molecules</p>	5.2.12.A.2	2 weeks	<p>Archimedes lab</p> <p>Calorimetry lab</p> <p>Investigation into the conservation of energy.</p>
<p>III. Energy Transfer and Conservation</p> <p>1) The potential energy of an object on Earth's surface is increased when the object's position is changed from one closer to Earth's surface to one farther from Earth's surface.</p>	5.2. 12. D1	2 weeks	<p>Kynex simple machines lab</p> <p>Pendulum Project</p>
<p>2) Energy may be transferred from one object to another during collisions.</p>	5.2.12.D4	3-4 weeks	<p>Collision labs</p>
<p>III. Forces and Motion</p> <p>1) The motion of an object can be described by its position and velocity as functions of time and by its average speed and average acceleration during intervals of time.</p>	5.2.12. E1	4 weeks	<p>Newton laws investigation</p>
<p>2) Objects undergo different kinds of motion (translational, rotational, and vibrational).</p>	5.2.12.E2	3 weeks	<p>Accelerated motion lab</p>
<p>3) The motion of an object changes only when a net force is applied.</p>	5.2.12.E3	2 weeks	<p>Gravity lab-free fall</p> <p>Marble lab-projectile</p>
<p>4) The magnitude of acceleration of an object depends directly on the</p>	5.2.12.E4	2 weeks	<p>Friction lab</p>

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strength of the net force, and inversely on the mass of the object. This relationship ($a=F_{net}/m$) is independent of the nature of the force.			
<p>IV. Objects in the Universe</p> <p>1) Prior to the work of 17th-century astronomers, scientists believed the Earth was the center of the universe (geocentric model).</p> <p>2) The properties and characteristics of solar system objects, combined with radioactive dating of meteorites and lunar samples, provide evidence that Earth and the rest of the solar system formed from a nebular cloud of dust and gas 4.6 billion years ago</p> <p>3) Stars experience significant changes during their life cycles, which can be illustrated with an Hertzsprung-Russell (H-R) Diagram.</p> <p>4) The Sun is one of an estimated two hundred billion stars in our Milky Way galaxy, which together with over one hundred billion other galaxies, make up the universe.</p> <p>5) The Big Bang theory places the origin of the universe at approximately 13.7 billion years ago. Shortly after the Big Bang, matter (primarily hydrogen and helium) began to coalesce to form galaxies and stars.</p> <p>6) According to the Big Bang theory, the universe has been expanding since its beginning, explaining the apparent movement of galaxies away from one another.</p>	<p>5.4.12.A1</p> <p>5.4.12.A2</p> <p>5.4.12.A3</p> <p>5.4.12.A4</p> <p>5.4.12.A5</p> <p>5.4.12.A6</p>	<p>2 weeks</p>	<p>Universe Project and Group Presentation</p> <p>Circular Motion Lab</p>
<p>V. Tectonics</p> <p>1) Convection currents in the upper mantle drive plate motion. Plates are pushed apart at spreading zones and pulled down into the crust at subduction zones.</p> <p>2) Evidence from lava flows and ocean-floor rocks shows that Earth's magnetic field reverses (North – South) over geologic time</p>	<p>5.4.12.D1</p> <p>5.4.12.D2</p>	<p>2 weeks</p> <p>2 weeks</p>	<p>Universe Project Continuation</p>