Active Physics Correlation for Michigan

	Communication			Home			Medicine			Predictions			Sports			Transportation		
"X" = Coverage **Secondary concept of the activity or problem. Students gain a basic understanding or introduction of the concept.** **"XX" = In-depth Coverage** **Primary concept that is the focus of the activity or problem. Students gain thorough understanding of the concept. Coverage in Student Edition and/or Teacher Edition supports the development of the concept.**	Chapter 1	Chapter 2	Chapter 3	Chapter 1	Chapter 2	Chapter 3	Chapter 1	Chapter 2	Chapter 3	Chapter 1	Chapter 2	Chapter 3	Chapter 1	Chapter 2	Chapter 3	Chapter 1	Chapter 2	Chapter 3
I. Construct New Scientific and Personal Knowledge																		
Content Standard 1: All students will ask questions that help them learn about the world; design and conduct investigations using appropriate methodology and technology; learn from books and other sources of information; communicate their findings using appropriate technology; and reconstruct previously learned knowledge. (Constructing New Scientific Knowledge.)																		
1.Develop questions or problems for investigation that can be answered empirically. (Key concepts: understanding the need to build on existing knowledge and to ask questions that can be investigated empirically. Real-world contexts: See Understanding Scientific Knowledge.)	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX
2. Suggest empirical tests of hypotheses. (Key concepts: Hypothesis, prediction, test, conclusion. Real-world contexts: See Using Scientific Knowledge.)	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX
3. Design and conduct scientific investigations. (Key concepts: Types of scientific knowledge—hypothesis, theory, observation, conclusion, law, data, generalization. Aspects of field research—observations, variable, experimental group, control group, prediction, conclusion. Real-world contexts: See Using Scientific Knowledge.)	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX
4. Diagnose possible reasons for failures of mechanical or electronic systems. (Key concepts: Documentation of systems, such as diagrams, owner manuals, troubleshooting guides. Procedures for identifying malfunctioning components or connections. Real-world contexts: Mechanical systems, such as bicycles, small appliances; electronic systems, such as videocassette recorders, stereo systems, computers.)	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX

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5. Assemble mechanical or electronic systems using appropriate tools and instructions. (Key concepts: Documentation of systems, such as diagrams, owner manuals, assembly instructions. Tools: Screwdrivers, pliers, hammers. Real-world contexts: Mechanical systems, such as bicycles, prepackaged furniture; electronic systems, such as videocassette recorders, stereo systems, computers.)	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX
6. Recognize and explain the limitations of measuring devices. (Key concepts: Uncertainty, error, range. Tools: Balancing devices, measuring cups and spoons, measuring tape. Real-world contexts: Designing an experiment using quantitative data.)	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX
7. Gather and synthesize information from books and other sources of information. (Key concepts: Scientific periodicals, reference books, trade books. Real-world contexts: Libraries, technical reference books.)	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX
8. Discuss topics in groups by being able to restate or summarize what others have said, ask for clarification or elaboration, and take alternative perspectives. (Key concepts: A newspaper or magazine article discussing a topic of social concern. Real-world contexts: A newspaper or magazine article discussing a topic of social concern.)	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX
9. Reconstruct previously learned knowledge. *(* Key concepts: Appropriate scientific contexts—See Using Scientific Knowledge. Real-world contexts: See Using Scientific Knowledge.)	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX
II. Reflect on the Nature, Adequacy and Connections Across Scientific Knowledge																		
Content Standard 1: All students will analyze claims for their scientific merit and explain how scientists decide what constitutes scientific knowledge; how science is related to other ways of knowing; how science and technology affect our society; and how people of diverse cultures have contributed to and influenced developments in science. (Reflecting on Scientific Knowledge.)																		

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1. Justify plans or explanations on a theoretical or empirical basis. (Key concepts: Aspects of logical argument, including evidence, fact, opinion, assumptions, claims, conclusions, observations. Real-world contexts: See Using Scientific Knowledge.)	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX
2. Describe some general limitations of scientific knowledge. (Key concepts: Understanding of the general limits of science and scientific knowledge as constantly developing human enterprises. Real-world contexts: See Using Scientific Knowledge.)	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX
3. Show how common themes of science, mathematics, and technology apply in real-world contexts. (Thematic ideas: Systems-subsystems, feedback models, mathematical constancy, scale, conservation, structure, function, adaptation. Real-world contexts: See Using Scientific Knowledge.)	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX
4. Discuss the historical development of key scientific concepts and principles. (Key concepts: Historical, political, social, and economic factors influencing the development of science. Real-world contexts: Historical development of key scientific theories, such as evolution, the germ theory of disease, principles of genetics, plate tectonics, atomic theory, Newtonian physics.)		X						X		X	X						X	
5. Evaluate alternative long-range plans for resource use and byproduct disposal in terms of environmental and economic impact. (Key concepts: Understanding of limitations of knowledge and technology, side effects of resource use. Real-world contexts: Large-scale systems for mining, energy use, manufacturing, transportation, housing.)				XX	XX													
6. Describe the historical, political, and social factors affecting developments in science. (Key concepts: Historical, political, social, and economic factors influencing the development of science. Real-world contexts: An example might be the development of the sun-centered model of the solar system.)	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX

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IV. Use Scientific Knowledge from the Physical Sciences in Real-World Contexts																		
Content Standard 1: All students will measure and describe the things around us; explain what the world around us is made of; identify and describe forms of energy; and explain how electricity and magnetism interact with matter. (Matter and Energy.)																		
1. Describe and compare objects in terms of mass, volume, and density. (Key concepts: Units of density—grams per cubic centimeter or grams per milliliter. Measurement tools and units describing mass and volume: Balances, spring scales, measuring cups or graduated cylinders, thermometers, metric ruler; kilogram, gram, liter, degrees Fahrenheit, degrees Celsius. Real-world contexts: Common objects and substances—see above; events involving floating and sinking, such as wood floating in water, oil and water, hot air balloons, submarines, lake turnover.)																		
2. Explain how families of elements are related by common properties. (Tools: Periodic Table of Elements. Materials: various element samples. Real-world contexts: Common elements—calcium, magnesium, sulfur, oxygen, chlorine, iodine, silicon, carbon; properties of elements which make them useful in technological systems.)																		
3. Analyze properties of common household and agricultural materials in terms of risk/benefit balance. *(* Key concepts: Risk/benefit analysis. Real-world contexts: Herbicides, refrigerants, fertilizers, detergents.)																		
4. Describe and explain the structural parts and electrical charges of atoms. (Key concepts: Parts of atoms—nucleus, electron cloud. Subatomic particles—proton, neutron, electron. Electrical charges—positive, negative, neutral. Real-world contexts: All elements, relationships from Periodic Table.)																		
5. Describe how energy is conserved during transformations. (Key concepts: Law of Conservation of Energy. Real-world contexts: Motors, generators, power plants, light bulbs, appliances, cars, radios, lifting an object, roller coaster, human body systems.)		X		X	X	X							X	X	X			

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6. Explain changes in matter and energy involving heat transfer.(Key concepts: Mechanisms of heat transfer—convection, conduction, radiation. Efficiency. Real-world contexts: Convection currents, lake turnover, wind, hot frying pans, heating and cooling buildings, heat lamps, sunlight heating the Earth.)					X													
7. Describe how electric currents can be produced by interacting wires and magnets. (Key concepts: Electromagnetic induction, current flow and direction, magnetic fields. Real-world contexts: Generators, transformers.)		XX			XX	XX												
8. Construct and explain simple circuits using wires, light bulbs, fuses, switches, and power sources. (Key concepts: Complete circuit, short circuit, series circuit, parallel circuits, open circuit, closed circuit, power supply, batteries, dry cells, fuses, switches, current, power, electric potential. Real-world contexts: Household wiring, automobile wiring, flashlights, tree lights.)	XX	XX			XX	XX	XX		XX							XX	XX	
Content Standard 2: All students will investigate, describe and analyze ways in which matter changes; describe how living things and human technology change matter and transform energy; explain how visible changes in matter are related to atoms and molecules; and how changes in matter are related to changes in energy. (Changes in Matter.)																		
1. Explain how mass is conserved in physical and chemical changes. (Key concepts: Law of Conservation of Mass. Real-world contexts: Common physical and chemical changes above; see elementary benchmark 1, and middle -school benchmarks 1, 2, and 3.)																		
2. Describe nuclear changes in terms of the properties of reactants and products. (Key concepts: Nucleus, nuclear change, nuclear energy. Real-world contexts: Nuclear power plants, nuclear energy from sun, natural radioactive decay.)										XX								
3. Trace, to an original source, the energy used by living things and machines. (Key concepts: Food, fuel, renewable and nonrenewable resources. Real-world contexts: Fossil fuels, nuclear energy, sun, electricity, manufacturing, transportation, digestion, photosynthesis.)		XX		XX	XX	XX							XX	XX	XX			

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4. Describe how common materials are made and disposed of or recycled. (Key concepts: Descriptions of physical and chemical changes. Manufacturing—refining, mining, waste disposal. Real-world contexts: Manufacturing processes—steel mills, auto assembly lines, paper making; recycling—glass, aluminum, paper, plastic, water treatment; disposal—landfills, incinerators.)		XX																
5. Explain chemical changes in terms of the arrangement and motion of atoms and molecules. (Key concepts: Description of chemical change at molecular level, see Matter and Energy benchmarks. Description of chemical change—burning paper, rusting iron, formation of sugars during photosynthesis, atom, molecule, bond, reactant, product, conservation of matter. Real-world contexts: Examples of chemical change—see middle- school benchmarks 2 and 3.)																		
6. Describe, compare, and contrast changes in atoms and/or molecules during physical, chemical, and nuclear changes. (Key concepts: Atomic/ molecular descriptions of physical and chemical substances and changes. Also see, Matter and Energy benchmarks. Real-world contexts: Physical and chemical changes in natural and technological systems; nuclear changes—nuclear power plants, bombs, natural radioactive decay, medical use of isotopes, nuclear reactions in the sun.)																		
7. Describe energy changes associated with physical and chemical changes. (Key concepts: Physical change, chemical change, potential energy, kinetic energy. Real-world contexts: Physical changes—dehydrated foods, solid air fresheners, recycling glass; chemical changes—some hot and cold packs, burning fuels, corrosion.)																		
8. Describe, compare and contrast relative magnitudes of energy changes involved in physical, chemical and nuclear changes. (Key concepts: Physical change, chemical change, potential energy, kinetic energy. Real-world contexts: See high school benchmarks 5 and 6.)																		

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Content Standard 3: All students will describe how things around us move and explain why things move as they do; demonstrate and explain how we control the motions of objects; and relate motion to energy and energy conversions. (Motion of Objects.)																		
1. Perform measurements and calculations to describe the speed and direction of an object. (Key concepts: Units of measure—meter, kilometer, seconds, hour, meters/sec, kilometers/hour. Measurement instruments—rulers, tape measures, stopwatches, clocks, speedometers, compasses. Real-world contexts: Common objects moving in two or three dimensions—see middle-school benchmark 1.)											XX		XX	XX	XX			
2. Describe that whenever one object exerts a force on a second object, the second object exerts an equal and opposite force on the first object. (Key concepts: Action force, reaction force. Real-world contexts: Walking, swimming, jumping, rocket motion.)											XX			XX				
3. Analyze the operation of machines in terms of force and motion. (Key concepts: Force, motion, and changes of motion—speeding up, slowing down, turning, push, pull, friction, gravity, attraction, repulsion, balanced, unbalanced. Real-world contexts: Machines, such as bicycles, automobiles, electrical motors, generators.)											XX			XX				
4. Explain energy conversions in moving objects and in simple machines. (Key concepts: Types of energy—kinetic energy, potential energy, heat energy. Conversions—see Matter and Energy benchmarks, Efficiency. Real-world contexts: Simple and complex machines—see elementary benchmark 3; roller coasters, swings, pendulums.)											XX			XX	XX			
Content Standard 4: All students will describe sounds and sound waves; explain shadows, color, and other light phenomena; measure and describe vibrations and waves; and explain how waves and vibrations transfer energy. (Waves and Vibrations.)																		
1. Relate characteristics of sounds that we hear to properties of sound waves. (Key concepts: Properties of sounds—pitch, volume. Characteristics of sound waves—frequency, amplitude, velocity. Real-world contexts: Common sounds that vary in pitch and volume—see elementary benchmark 1.)	XX						XX											

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2. Explain how sound recording and reproducing devices work. (Key concepts: Parts of sound recording and reproducing devices, including needle, amplifier, speaker, microphone, laser disk reader. Real-world contexts: Sound devices, such as record players, tape recorders, medical ultrasound devices, hearing aids, laser disk players.)			XX															
3. Relate colors to wavelengths of light. (Key concepts: Colors of the spectrum—red, orange, yellow, green, blue, indigo, violet. Properties of light waves: wavelength, amplitude, frequency. Tools for making spectra: Prism, diffraction grating. Real-world contexts: Spectra made by prisms, diffraction gratings; colored lights, rainbow glasses, rainbows.)	XX		XX															
4. Explain how we see colors of objects. (Key concepts: Colors of the spectrum and characteristics of light waves—red, orange, yellow, green, blue, indigo, violet, wavelength, amplitude, frequency. Ways that objects interact with light—emission, reflection, absorption, transmission. Real-world contexts: Colored light-reflecting objects, such as books, clothes, color photographs; colored light-transmitting objects, such as stained glass, cellophane; colored light-emitting objects, such as television, neon lights.)	XX																	
5. Describe different types of waves and their technological applications. (Key concepts: Types of waves—mechanical: sound, ultrasound, water waves, shock wave; electromagnetic: radio waves, microwaves, radiant heat, infrared radiation, visible light, ultraviolet radiation, x-rays, gamma rays. Properties of waves—frequency, amplitude, wavelength, wave velocity. Real-world contexts: Examples of mechanical waves, such as sound—see above, ocean waves, wave tanks, earthquakes, seismic waves; examples of electromagnetic waves, such as light—see above, radio and television signals, heat lamps, microwave transmitters, ultraviolet radiation in sunlight, x-ray machines, gamma rays from radioactive decay.)			XX						XX									

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6. Describe waves in terms of their properties (frequency, amplitude, wavelength, wave velocity). (Key concepts: Mechanical and electromagnetic waves. Properties of waves—frequency, amplitude, wavelength, wave velocity. Units of measurement—hertz or cycles per second, micrometers, meters, meters per second. Real-world contexts: Examples of mechanical and electromagnetic waves—see above.)	XX	XX	XX				XX					XX						
7. Describe the behavior of waves when they interact. (Key concepts: Super-position, constructive and destructive interference. Real-world contexts: Dead spots in auditoriums, spectra made by diffraction gratings, colors observed in soap bubbles.)			XX									XX						
8. Relate changes in detected frequency of a source to the motion of the source and/or the detector. (Key concepts: Wavelength, frequency, source, detector, motion, shifts in frequency and wavelength. Real-world contexts: Engine noise from cars passing by, spectrum of stars, Doppler weather radar, police radar.)			XX						XX									
9. Explain how energy is stored and transformed in vibrating and oscillating objects. (Key concepts: Kinetic energy, potential energy, total energy. Real-world contexts: Examples of vibrating or oscillating objects—see middle-school benchmark 5.)	XX	XX	XX															