Active Physics Correlation to the Missouri Standards

Correlation key:

"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.

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I. Scientific Inquiry																		
A. Processes of Scientific Inquiry																		
1. Investigations may involve mathematical procedures to interpret observations, make predictions, describe sets of data, and determine the validity and significance of experimental results.																		
a. analyze experimental data to determine patterns, relationships, perspectives, and credibility; use computer spreadsheets, graphing, and data base programs to assist in quantitative analysis; and consider the possible effects of measurement errors on calculations.	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX
2. Publication and presentation of scientific work with supporting evidence are required for critique, review, and validation by the scientific community. The presentation of such work adds to the body of scientific knowledge and serves as background for subsequent investigations in similar areas.																		
a. analyze experimental data to determine patterns, relationships, perspectives, and credibility; use computer spreadsheets, graphing, and data base programs to assist in quantitative analysis; and consider the possible effects of measurement errors on calculations.	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX
3. Controlling all variables that might influence an experiment is important. Sometimes it is not possible, for practical or ethical reasons, to control some conditions, but a wide range of observations of natural occurrences can reveal patterns.																		
a. make systematic observations (nonexperimental) of natural objects or events to discern patterns, formulate explanations, support a thesis, or make predictions.	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX
4. Technological tools and techniques extend human capabilities to perform investigations in more detail and with greater accuracy and precision.																		

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a. apply technological knowledge and skills to analyze and troubleshoot common mechanical and electrical systems, checking for possible causes of malfunction, and formulate and test logical and creative improvements that prevent future malfunctions.	**x**	**xx**	**xx**	**x**	**xx**	**xx**	**xx**	**x**	**xx**	**x**	**xx**	**xx**	**x**	**xx**	**x**	**xx**	**xx**	**xx**
B. Investigations																		
1. The testing, revising, and occasional discarding of theories lead to increasingly better understanding, but not to absolute truth. New ideas, therefore, usually grow slowly from contributions by many investigators.																		
a. formulate questions for scientific investigations that indicate conceptual insights and a depth of understanding of the historical development of the idea or issue to be investigated.	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**
2. Scientists attempt to improve objectivity of data observation and the academic integrity of their research by working in teams and seeking out possible sources of bias.																		
a. recognize and practice academic integrity while conducting investigations and developing solutions, seeking out sources of personal bias in the design of investigations.	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**
3. The testing of a hypothesis requires a structured and rigorous investigative process.																		
a. design and conduct a full scientific investigation including a comprehensive review of related literature: experimental design that is thoughtful and well-controlled, with adequate repeated trials; accurate measurement of data; some form of statistical treatment and display of data; thoughtful interpretation of data; and communication and defense of logical arguments supported by the finding.	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**

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II. Scientific Relevance																		
A. The Nature of Technology																		
1. Social and economic forces, such as personal values, consumer acceptance, patent laws, the federal budget, current regulations, media attention, and economic competition strongly influence the direction of progress of science and technology. Progress in science and technology, on the other hand, often result in many ethical, legal, and public policy issues.																		
a. discuss the scientific, technological , and political aspects of major challenges to society. Describe how each of these aspects influences public policy formulation in dealing with the challenges.		**XX**	**XX**	**XX**	**XX**		**XX**	**XX**	**XX**					**XX**		**XX**		**XX**
2. Human beings have a huge impact on other species, their environments, and technology. These impacts include reducing the amount of habitat available, interfering with food sources, changing the temperature and chemical composition of their habitats, introducing foreign species, and altering organisms directly through selective breeding and genetic engineering.																		
a. analyze and evaluate how specific technological solutions may impact the environment in areas such as habitat loss, disruption of the food web, and temperature and chemical changes.																		
B. Historical Perspective																		
1. Scientific theories are developed based on the body of knowledge that exists at any particular time. The driving force to find what is really true motivates scientists to test the validity of these theories and as a result the mysteries of nature are continuously probed and explained as new theories are created and old theories discarded.																		
a. identify and analyze theories that are currently being questioned, and compare them to new theories that have emerged to challenge the older ones.												**X**						

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2. The history of scientific thought spanned many cultures and centuries. The early Egyptian, Greek, Chinese, Hindu, and Arabic cultures are responsible for many scientific and mathematical ideas and technological inventions. Modern science is based on traditions of thought that came together in Europe about 500 years ago. All cultures now contribute to that tradition.																		
a. identify and analyze various scientific concepts, inventions, and technological innovations that have been developed by different cultures from around the world; discuss the influence of prevailing contemporary thought on the acceptance of these concepts, inventions, and innovations by other scientists and society.			x	x	x	x		x	x	x		x		x	x		x	x
C. Science as a Human Endeavor																		
1. Scientists make mistakes like all people. Deliberate deceit, however, is rare and is likely to be exposed eventually by the scientific enterprise itself.																		
a. identify, discuss, and respond thoughtfully to information from credible sources, such as scientists making claims in their areas of expertise, and from sources of questionable credibility, such as people whose own personal, institutional, or community interests are at stake.																		
2. Research funding comes from various federal government agencies, industry, and private foundations. Research grant proposals are written to promote research that is relevant, well designed, cost efficient, and well supported by previous research.																		
a. analyze a scientific research grant proposal and defend or dispute, in an organized and convincing way, sections that promote the proposed research.												xx						

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III. Matter and Energy																		
A. Properties, Characteristics and Structures of Matter																		
1. The Periodic Table organizes the elements according to their physical properties and chemical reactivity.																		
a. demonstrate how the Periodic Table can be used to predict the properties of elements and determine trends in these properties as they relate to the physical world.																		
2. Models can be used to represent elements, compounds, and ions.																		
a. describe the molecular, atomic, and ionic make-up of a variety of substances; use the appropriate formula to represent these substances and explain how the arrangement and motion of molecules determine a variety of biological, chemical, and physical phenomena.																		
b. use bonding diagrams to show ionic and covalent bonding and to predict the outcome of a chemical reaction.																		
3. Solution properties depend upon the concentrations, properties, and interactions of the solutes and solvents.																		
a. analyze and discuss the types and concentration of solute or solvent that affect the rate of solubility, acidity, viscosity of the solution.																		
4. The particulate model describes the electrically neutral atom.																		
a. describe the components of the modern model of an atom and how they are related.										**x**								

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B. Characteristics, Forms and Sources of Energy																		
1. Chemical and nuclear reactions provide energy that sustains industrial, life, and social processes.																		
a. conduct an investigation on how energy has been obtained/used and the consequences of its use.					x					x								
2. The amount and rate of energy change for any process can be quantified.																		
a. determine the amount of heat required to change the temperature or state of a substance.				x														
3. Energy can be transferred as waves. The frequency and wavelengths of the waves are affected by the relative motion of the source and receiver.																		
a. explain the Doppler Effect and identify some of its applications.			x						x									
4. Voltage and resistance affect the flow of electric current in a circuit.																		
a. design an electrical circuit.					xx	xx										x		
C. Interactions of Matter and Energy																		
1. Chemical, physical, and nuclear changes involve energy transfers.																		
a. describe how energy is involved in chemical, physical, and nuclear changes.		x		xx	xx	x	x		x				x	x	x			
2. Heat flows from a body of a higher temperature to one of a lower one.																		
a. distinguish the direction of thermal energy in natural processes.				x	x													
b. investigate the relationship between heat and work.					x													
3. Phase changes can occur due to a quantitative transfer of heat energy.																		
a. investigate phase changes that are induced by adding/subtracting heat energy and explain, using the particulate model, how the interaction of atoms or molecules during a change of state affects the properties of the substance.																		

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4. The interaction of energy and matter may result in the formation of heat or other energy forms.																		
a. describe the interaction of energy waves with the materials of man-made devices.	**xx**	**xx**		**xx**	**xx**													
5. Nuclear reactions can change matter into energy and vice versa. The total quantity of matter and energy is conserved.																		
a. analyze the amount of energy contained in the mass of substance.					**x**													
6. Solar energy travels through space, is distributed on Earth by radiation, conduction, or convection, and powers atmospheric and oceanic circulation.																		
a. explain how the transfer of energy by air and ocean currents regulate the physical environment of the Earth.																		
IV. Force, Motion and Mechanical Energy																		
A. Relative Motion																		
1. Motion can be described in terms of velocity and acceleration and be represented by equations and vectors.																		
a. represent and analyze motion both quantitatively and graphically using velocity and acceleration.											**xx**		**xx**	**xx**	**xx**	**xx**	**xx**	**xx**
B. Types and Properties of Forces and Motion																		
1. The acceleration of an object is related to its mass and the force acting on it.																		
a. analyze information from inquiries to interpret the effects of forces on velocity, acceleration, and equilibrium of an object.											**xx**			**xx**	**x**		**xx**	**xx**
2. The action of all forces can be explained by Newton's Laws of Motion that are used to predict changes in linear and/or rotational motion.																		
a. evaluate information to describe how Newton's Laws of Motion are used to describe moving objects.											**xx**			**xx**			**xx**	
3. Moving electric charges produce magnetic fields that exert a magnetic force on other objects; moving magnets can produce electric forces.																		

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a. select and apply appropriate strategies to investigate the relationship between a magnetic force and an electric current and devise a practical application using this relationship.		**XX**				**XX**											**X**	
C. Interactions of Forces and Motions																		
1. A force acting on an object, moving it through a distance, can change its kinetic energy, potential energy, or both.																		
a. describe the forces acting on a moving object that changes the object's kinetic and potential energy.													**XX**	**XX**	**XX**			
2. The ratio of output work to input energy is the efficiency of a machine or process and is always less than 100%. Power is the rate at which work is done.																		
a. analyze and describe the relationship among work, power, and efficiency.					**XX**													
3. The Law of Conservation of Momentum can be used to predict the outcome of collisions.																		
a. evaluate information to describe and discuss the result of a collision between two or more moving objects.														**XX**			**XX**	