



**Alignment Document**  
**State of Pennsylvania**  
**And**  
**Aventa Learning Physical Science Grades 8-10**

**Physical Science Grades 8-10**  
 2005-2007 Benchmark Blueprint

| State Standard Number | State Standard Area / Description   | Unit Name     | Course Topic Description |
|-----------------------|---|---------------|--------------------------|
| 3.1.10                | Unifying Themes   |               |                          |
| 3.1.10.A              | Discriminate among the concepts of systems, subsystems, feedback and control in solving technological problems.   |               |                          |
| 3.1.10.A.1            | Identify the function of subsystems within a larger system (e.g., role of thermostat in an engine, pressure switch).  |               |                          |
| 3.1.10.A.2            | Describe the interrelationships among inputs, processes, outputs, feedback and control in specific systems.   |               |                          |
| 3.1.10.A.3            | Explain the concept of system redesign and apply it to improve technological systems.   |               |                          |
| 3.1.10.A.4            | Apply the universal systems model to illustrate specific solutions and troubleshoot specific problems.  | Doing Science | Experimental set up      |
| 3.1.10.A.5            | Analyze and describe the effectiveness of systems to solve specific problems.   | Doing Science | Experimental set up      |
| 3.1.10.B              | Describe concepts of models as a way to predict and understand science and technology.  |               |                          |
| 3.1.10.B.1            | Distinguish between different types of models and modeling techniques and apply their appropriate use in specific applications (e.g., kinetic gas theory, DNA). |               |                          |

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| 3.1.10.B.2 | Examine the advantages of using models to demonstrate processes and outcomes (e.g., blue print analysis, structural stability).  |                   |                               |
| 3.1.10.B.3 | Apply mathematical models to science and technology.   |                   |                               |
| 3.1.10.C   | Apply patterns as repeated processes or recurring elements in science and technology.  |                   |                               |
| 3.1.10.C.1 | Examine and describe recurring patterns that form the basis of biological classification, chemical periodicity, geological order and astronomical order.   |                   |                               |
| 3.1.10.C.2 | Examine and describe stationary physical patterns.   |                   |                               |
| 3.1.10.C.3 | Examine and describe physical patterns in motion.  |                   |                               |
| 3.1.10.D   | Apply scale as a way of relating concepts and ideas to one another by some measure.  |                   |                               |
| 3.1.10.D.1 | Apply dimensional analysis and scale as a ratio.   |                   |                               |
| 3.1.10.D.2 | Convert one scale to another.  |                   |                               |
| 3.1.10.E   | Describe patterns of change in nature, physical and man made systems.  |                   |                               |
| 3.1.10.E.1 | Describe how fundamental science and technology concepts are used to solve practical problems (e.g., momentum, Newton's laws of universal gravitation, tectonics, conservation of mass and energy, cell theory, theory of evolution, atomic theory, theory of relativity, Pasteur's germ theory, relativity, heliocentric theory, gas laws, feedback systems). | Energy and Motion | Newton's First Law of Motion  |
|            |  | Forces            | Newton's Second Law of Motion |
|            |  | Forces            | Newton's Third Law            |
| 3.1.10.E.2 | Recognize that stable systems often involve underlying dynamic changes (e.g., a chemical reaction at equilibrium has molecules reforming continuously).  |                   |                               |

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| 3.1.10.E.3 | Describe the effects of error in measurements.   |               |                     |
| 3.1.10.E.4 | Describe changes to matter caused by heat, cold, light or chemicals using a rate function.   |               |                     |
| 3.2.10     | Inquiry and Design   |               |                     |
| 3.2.10.A   | Apply knowledge and understanding about the nature of scientific and technological knowledge.  |               |                     |
| 3.2.10.A.1 | Compare and contrast scientific theories and beliefs.  |               |                     |
| 3.2.10.A.2 | Know that science uses both direct and indirect observation means to study the world and the universe.   |               |                     |
| 3.2.10.A.3 | Integrate new information into existing theories and explain implied results.  |               |                     |
| 3.2.10.B   | Apply process knowledge and organize scientific and technological phenomena in varied ways.  |               |                     |
| 3.2.10.B.1 | Describe materials using precise quantitative and qualitative skills based on observations.  |               |                     |
| 3.2.10.B.2 | Develop appropriate scientific experiments: raising questions, formulating hypotheses, testing, controlled experiments, recognizing variables, manipulating variables, interpreting data, and producing solutions. |               |                     |
| 3.2.10.B.3 | Use process skills to make inferences and predictions using collected information and to communicate, using space / time relationships, defining operationally.  |               |                     |
| 3.2.10.C   | Apply the elements of scientific inquiry to solve problems.  | Doing Science | Experimental Set Up |
| 3.2.10.C.1 | Generate questions about objects, organisms and/or events that can be answered through scientific investigations.  | Doing Science | Experimental Set Up |
| 3.2.10.C.2 | Evaluate the appropriateness of questions.   |               |                     |

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| 3.2.10.C.3 | Design an investigation with adequate control and limited variables to investigate a question.                                      |        |                        |
| 3.2.10.C.4 | Conduct a multiple step experiment  |        |                        |
| 3.2.10.C.5 | Organize experimental information using a variety of analytic methods.  |        |                        |
| 3.2.10.C.6 | Judge the significance of experimental information in answering the question.   |        |                        |
| 3.2.10.C.7 | Suggest additional steps that might be done experimentally.   |        |                        |
| 3.2.10.D   | Identify and apply the technological design process to solve problems.  |        |                        |
| 3.2.10.D.1 | Examine the problem, rank all necessary information and all questions that must be answered.  |        |                        |
| 3.2.10.D.2 | Propose and analyze a solution.   |        |                        |
| 3.2.10.D.3 | Implement the solution.   |        |                        |
| 3.2.10.D.4 | Evaluate the solution, test, redesign and improve as necessary.   |        |                        |
| 3.2.10.D.5 | Communicate the process and evaluate and present the impacts of the solution.   |        |                        |
| 3.4.10     | Physical Science, Chemistry and Physics   |        |                        |
| 3.4.10.A   | Explain concepts about the structure and properties of matter.  | Matter | Matter                 |
| 3.4.10.A.1 | Know that atoms are composed of even smaller sub-atomic structures whose properties are measurable.                                 |        |                        |
| 3.4.10.A.2 | Explain the repeating pattern of chemical properties by using the repeating patterns of atomic structure within the periodic table. |        |                        |
| 3.4.10.A.3 | Predict the behavior of gases through the use of Boyle's, Charles' or the ideal gas law, in everyday situations.                    |        |                        |
| 3.4.10.A.4 | Explain the formation of compounds and their resulting properties using bonding theories (ionic and covalent).                      | Matter | Elements and Compounds |
| 3.4.10.A.5 | Recognize formulas for simple inorganic compounds.  | Matter | Elements and Compounds |

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| 3.4.10.A.6 | Describe various types of chemical reactions by applying the laws of conservation of mass and energy.                             | Chemical Reactions        | Chemical Reactions            |
| 3.4.10.A.7 | Apply knowledge of mixtures to appropriate separation techniques.   |                           |                               |
| 3.4.10.A.8 | Understand that carbon can form several types of compounds.   | Atomic Structure          | Carbon Atoms                  |
| 3.4.10.A.9 | Describe phases of matter according to the Kinetic Molecular Theory.  |                           |                               |
| 3.4.10.B   | Analyze energy sources and transfers of heat.   |                           |                               |
| 3.4.10.B.1 | Determine the efficiency of chemical systems by applying mathematical formulas.   |                           |                               |
| 3.4.10.B.2 | Use knowledge of chemical reactions to generate an electrical current.  |                           |                               |
| 3.4.10.B.3 | Evaluate energy changes in chemical reactions.  | Chemical Reactions        | Chemical Reactions            |
| 3.4.10.B.4 | Use knowledge of conservation of energy and momentum to explain common phenomena (e.g., refrigeration system, rocket propulsion). |                           |                               |
| 3.4.10.B.5 | Explain resistance, current and electro-motive force (Ohm's Law).   | Electricity and Magnetism | Ohm's law                     |
| 3.4.10.C   | Distinguish among the principles of force and motion.   | Energy and Motion         | Newton's First Law of Motion  |
|            |   | Forces                    | Newton's Second Law of Motion |
| 3.4.10.C.1 | Identify the relationship of electricity and magnetism as two aspects of a single electromagnetic force.                          | Electricity and Magnetism | Magnetism                     |
| 3.4.10.C.2 | Identify elements of simple machines in compound machines.  | Simple Machines           | Using machines                |
| 3.4.10.C.3 | Explain fluid power systems through the design and construction of appropriate models.  |                           |                               |
| 3.4.10.C.4 | Describe sound effects (e.g., Doppler effect, amplitude, frequency, reflection, refraction, absorption, sonar, seismic).          | Waves                     | Waves                         |

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| 3.4.10.C.5 | Describe light effects (e.g., Doppler effect, dispersion, absorption, emission spectra, polarization, interference).                           |                   |                              |
| 3.4.10.C.6 | Describe and measure the motion of sound, light and other objects.   | Waves             | Waves                        |
| 3.4.10.C.7 | Know Newton's laws of motion (including inertia, action and reaction) and gravity and apply them to solve problems related to forces and mass. | Energy and Motion | Sir Isaac and Seat Belts     |
|            |  | Energy and Motion | Newton's First Law of Motion |
|            |  | Forces            | Newton's Third Law           |
| 3.4.10.C.8 | Determine the efficiency of mechanical systems by applying mathematical formulas.  |                   |                              |
| 3.4.10.D   | Explain essential ideas about the composition and structure of the universe.   |                   |                              |
| 3.4.10.D.1 | Compare the basic structures of the universe (e.g., galaxy types, nova, black holes, neutron stars).   |                   |                              |
| 3.4.10.D.2 | Describe the structure and life cycle of star, using the Hertzsprung- Russell diagram.   |                   |                              |
| 3.4.10.D.3 | Describe the nuclear processes involved in energy production in a star.  |                   |                              |
| 3.4.10.D.4 | Explain the "red-shift" and Hubble's use of it to determine stellar distance and movement.   |                   |                              |
| 3.4.10.D.5 | Compare absolute versus apparent star magnitude and their relation to stellar distance.  |                   |                              |
| 3.4.10.D.6 | Explain the impact of the Copernican and Newtonian thinking on man's view of the universe.   |                   |                              |
| 3.4.10.D.7 | Identify and analyze the findings of several space instruments in regard to the extent and composition of the solar system and universe.       |                   |                              |