OFFICE OF INSTRUCTIONAL ENHANCEMENT AND INTERNAL OPERATIONS
Summary of State Board of Education Agenda Items
August 19-20, 2010

Office of Student Assessment

To approve the Performance Level Descriptors for the *2010 Mississippi Science Curriculum Framework* for statewide assessments in grade 5, grade 8, and Biology I.

(Has cleared the Administrative Procedures Act process with no public comments)

Under the requirements the *No Child Left Behind Act*, all states must develop descriptions of the knowledge and skills necessary for students to achieve specific performance levels on state assessments based on state curriculum standards. The State Board of Education approved the revised *2010 Mississippi Science Framework* on July 25, 2008. Consequently, the Performance Level Descriptors for grades 5, 8, and Biology I state assessments had to undergo revision to be aligned with the revised framework.

The Office of Student Assessment convened committees of teachers to create Performance Level Descriptors based upon the *2010 Mississippi Science Curriculum Framework* in compliance with State Board Policy 7608. These committees aligned the Performance Level Descriptors with the *2010 Mississippi Curriculum Science Framework* standards so that teachers, students, and parents could understand the expected level of student performance. The descriptors also guide the standard-setting processes to maximize the alignment of cut scores with the expectations specified in the standards. Standard-setting for the Grade 5 Science Test, Grade 8 Science Test, and Biology I Test will occur in summer 2011 following the first operational administrations of these tests. The Performance Level Descriptors will be used during that process as committees set cut scores for Basic, Proficient, and Advanced performance levels.

The Office of Instructional Enhancement and Internal Operations is requesting approval of the Performance Level Descriptors for the *2010 Mississippi Science Curriculum Framework* for statewide assessments in grade 5, grade 8, and Biology I.

Back-up material attached

Recommendation: Approval

Fifth Grade Science
Performance Level Descriptors

Performance Level	Descriptors for Inquiry Content Strand **Competency 1**
Advanced	1a. Design a fair scientific investigation including analyzing the data, forming conclusions, manipulating variables and using experimental controls. 1d. Justify a conclusion based upon data 1g. Justify that data are significant
Proficient	1a. Form a hypothesis and predict outcomes, based upon a fair investigation that includes manipulating variables and using experimental controls. 1b. Distinguish between observations and inferences. 1c. Use precise measurement (e.g. "to the nearest millimeter") in conjunction with simple tools and technology to perform tests and collect data. 1d. Organize and interpret data tables and graphs to construct explanations and draw conclusions. 1e. Use drawings, tables, graphs, and written and oral language to describe objects and explain ideas and actions. 1f. Make and compare different proposals when designing a solution or product. 1g. Evaluate whether data results are significant or insignificant. 1h. Infer and describe alternate explanations and predictions.
Basic	1a. Identify the components of a fair investigation (hypothesis, prediction or outcome, manipulating variables, or experimental control). 1c. Identify a simple tool and its associated unit of measurement used to collect data. 1d. Recognize data patterns 1f. Identify an appropriate design for the solution for a problem

Performance Level	Descriptors for Physical Science Content Strand **Competency 2**
Advanced	2a. Predict how an object will act and interact based on its properties. 2c. Predict the motion of an object based on position, direction of motion, and speed. 2g. Evaluate a marketable application of conductors and/or insulators.
Proficient	2a. Determine how the properties of an object affect how it acts and interacts. 2b. Differentiate between elements, compounds, and mixtures and between chemical and physical changes. 2c. Investigate the motion of an object in terms of its position, direction of motion, and speed. 2d. Categorize examples of potential energy as gravitational, elastic, chemical. 2e. Differentiate between the properties of light as reflection, refraction, and absorption. 2f. Describe physical properties of matter including mixtures and solutions. 2g. Categorize materials as conductors or insulators and discuss their real life applications.
Basic	2b. Identify elements, compounds, mixtures, chemical changes or physical changes. 2e. Recognize the effect of prisms, lenses, mirrors, and eyeglasses on the characteristics of light. 2f. Define mass, density, boiling point, freezing point and other physical properties of matter.

Performance Level	Descriptors for Life Science Content Strand **Competency 3**
Advanced	3a. Predict how structural or behavioral adaptations of an organism will allow that organisms to continue living in a changing environment. 3e. Predict how possible changes in the food web or environment will affect the flow of energy.
Proficient	3a. Compare and contrast the diversity of organisms due to adaptations to show how organisms have evolved as a result of environmental changes. 3b. Research and classify the organization of living things. 3c. Research and cite evidence of the work of scientists as it contributed to the discovery and prevention of disease. 3d. Distinguish between asexual and sexual reproduction. 3e. Give examples of how consumers and producers are related in food chains and food webs.
Basic	3a. Identify the adaptation that allows an organism to live in their particular environment. 3b. Identify the components (e.g., cells, organs, organ systems) within an organized, living system. 3d. Identify reproduction as asexual or sexual. 3e. Identify the levels of organization in a food chain or food web (e.g., producers, consumers, herbivores, carnivores, omnivores)

Performance Level	Descriptors for Earth and Space Science Content Strand **Competency 4**
Advanced	4b. Explain how constructive processes combine with destructive processes to create certain land features 4c. Predict weather based on the season and collected data. 4d. Critique ways to conserve natural resources. 4e. Compare the movement patterns of the moon around the Earth to the movement pattern of the Earth around the sun over a specific time period.
Proficient	4a. Categorize Earth's materials. 4b. Explain how surface features caused by constructive processes differ from destructive processes. 4c. Summarize how weather changes. 4d. Describe changes caused by humans on the environment and natural resources and cite evidence from research of ways to conserve natural resources in the United States, including Mississippi. 4e. Predict the movement patterns of the sun, moon, and Earth over a specified time period. 4f. Compare and contrast the physical characteristics of the planets. 4g.Conclude that the supply of many Earth resources is limited and critique a plan to extend the use of Earth's resources.
Basic	4a. Identify Earth's materials. 4b. Identify surface features formed from constructive or destructive processes. 4c. Identify tools used for collecting weather data 4e. Identify the location of the sun, moon, or Earth at a specific time period. 4f. Identify physical characteristics (e.g. mass, surface gravity, moons) of a planet

Eighth Grade Science
Performance Level Descriptors

Performance Level	Descriptors for Inquiry Content Strand **Competency 1**
Advanced	1a. Evaluate the design of an investigation, including the design's use of experimental controls and the design's effect on the conclusion. 1c. Predict the effect of summarized data. 1e. Justify whether an argument defending a conclusion is logical. 1h. Evaluate arguments based upon the scientific process for ideas presented as alternative conclusions.
Proficient	1a. Design, conduct, and analyze conclusions from an investigation that includes using experimental controls. 1b. Distinguish between qualitative and quantitative observations and make inferences based on observations. 1c. Summarize data to show the cause and effect relationship between qualitative and quantitative observations. 1d. Analyze evidence that is used to form explanations and draw conclusions. 1e. Develop a logical argument defending conclusions of an experimental method. 1f. Develop a logical argument to explain why perfectly designed solutions do not exist. 1g. Justify a scientist's need to revise conclusions after encountering new experimental evidence that does not match existing explanations. 1h. Analyze different ideas and recognize the skepticism of others as part of the scientific process in considering alternative conclusions.
Basic	1b. Identify an inference as being based on qualitative observations or quantitative observations. 1d. Identify evidence that supports an explanation or conclusion. 1h. Recognize appropriate scientific skepticism when reviewing alternative conclusions.

Performance Level	Descriptors for Physical Science Content Strand **Competency 2**
Advanced	2a. Balance chemical equations to illustrate the law of conservation of mass. 2c. Evaluate the motion of two or more objects to predict the effects of a Collision. 2d. Predict the outcome (positive or negative) of altering one component of the power grid system.
Proficient	2a. Identify patterns found in chemical symbols, formulas, reactions, and equations that apply to the law of conservation of mass. 2b. Predict the properties and interactions of given elements using the periodic table of the elements. 2c. Distinguish the motion of an object by its position, direction of motion, speed, and acceleration and represent resulting data in graphic form in order to make a prediction. 2d. Relate how electrical energy transfers through electric circuits, generators, and power grids, including the importance of contributions from Mississippi companies. 2e. Contrast various components of the electromagnetic spectrum (e.g., infrared, visible light, ultraviolet) and predict their impacts on living things. 2f. Recognize Newton's Three Laws of Motion and identify situations that illustrate each law (e.g., inertia, acceleration, action, reaction forces).
Basic	2a. Identify the chemical symbols, formulas of common substances, or reactions used in a balanced equation. 2b. Use the periodic table to identify the properties of an element or a simple compound. 2e. Identify components of the electromagnetic spectrum. 2f. Identify Newton's Three Laws of Motion.

Performance Level	Descriptors for Life Science Content Strand **Competency 3**
Advanced	3d. Analyze a pedigree diagram to predict the inheritance for a particular trait for a family member. 3e. Analyze the food web of an ecosystem in which the population of an organism has been altered to explain how this change may affect another member of the food web ecosystem. 3h. Explain the process of cellular respiration to the survival of the cell and its components.
Proficient	3a. Analyze how adaptations to a particular environment can increase an organism's survival and reproduction and relate organisms and their ecological niches to evolutionary change and extinction. 3b. Compare and contrast the major components and functions of different types of cells. 3c. Describe how viruses, bacteria, fungi, and parasites may infect the human body and interfere with normal body functions. 3d. Describe heredity as the passage of instructions from one generation to another and recognize that hereditary information is contained in genes, located in the chromosomes of each cell. 3e. Explain energy flow in a specified ecosystem. 3f. Develop a logical argument for or against research conducted in selective breeding and genetic engineering, including research conducted in Mississippi. 3g. Research and draw conclusions about the use of single-celled organisms in industry and in the production of food and about their impact on life. 3h. Describe how an organism gets energy form oxidizing its food and releasing some of its energy as heat.
Basic	3b. Identify different cell types and their structures. 3f. Identify examples of selective breeding or genetic engineering. 3g. Identify examples of single-celled organisms that are used in industry or food production or that impact life. 3h. Identify the reactants and products involved in cellular respiration.

Performance Level	Descriptors for Earth and Space Science Content Strand **Competency 4**
Advanced	4a. Explain how the composition of the lithosphere and asthenosphere affects plate movement. 4b. Predict geologic phenomena based on the composition and movement of interacting plates. 4c. Predict a change in weather based on differences in pressure, heat, air movement, and humidity. 4e. Explain how a change in the angle of Earth's axis affects climate and seasons. 4f. Explain techniques used to determine distances between objects in the universe or used to determine the age of the universe.
Proficient	4a. Compare and contrast the lithosphere and the asthenosphere. 4b. Describe the cause and effect relationship between the composition of and movement within the Earth's lithosphere. 4c. Examine weather forecasting and describe how meteorologists use atmospheric features and technology to predict the weather. 4d. Research the importance of the conservation of renewable and nonrenewable resources, including Mississippi, and justify methods that might be useful in decreasing the human impact on global warming. 4e. Explain how the tilt of Earth's axis and the position of the Earth in relation to the sun determine climatic zones, season, and length of the days. 4f. Describe the hierarchal structure (stars, clusters, galaxies, galactic clusters) of the universe and examine the expanding universe to include its age and history and the modern techniques used to measure object and distances in the universe. 4g. Justify the importance of continued research and use of new technology in the development and commercialization of potentially useful natural products, including, but not limited to research efforts in Mississippi. 4h. Justify why an imaginary hurricane might or might not hit a particular area, using important technological resources.
Basic	4a. Identify the composition, physical nature, or location of the lithosphere or the asthenosphere. 4b. Identify plate boundaries based on lithospheric movement. 4d. Identify renewable or nonrenewable resources. 4e. Identify the effect of Earth's tilt on its axis or the position of Earth in relation to the Sun on seasons and climate.

Biology
Performance Level Descriptors

Performance Level	Descriptors for Inquiry Content Strand **Strand 1: Inquiry**
Advanced	1c. Evaluate a question or hypothesis to develop an experimental design for a scientific investigation. 1d. Justify a prediction based upon the analysis of a graph or data.
Proficient	1a. Conduct a scientific investigation with accuracy and precision demonstrating safe procedures and proper use and care of laboratory equipment. 1b. Formulate questions that can be answered through research and experimental design. 1c. Apply the components of scientific processes and methods in classroom and laboratory investigations. 1d. Analyze graphs. 1e. Analyze procedures, data, and conclusions to determine the scientific validity of research. 1f. Recognize and analyze alternative explanations for experimental results and to make predictions based on observations and prior knowledge. 1g. Defend a scientific argument in oral, written, and graphic form.
Basic	1a. Identify and recognize the following in a scientific investigation: safe procedures (safety rules, chemical use and symbols), proper use and care of laboratory equipment (goggles, aprons, compound light microscope, slides, balance, beaker, thermometers, graduated cylinders and rulers). 1c. Recognize the components of scientific processes and methods in classroom and laboratory investigations (e.g. hypothesis, experimental design, observations, data analyses, interpretations, theory development). 1d. Construct a graph. 1g. Communicate conclusions based on experiments in oral, written, and graphic form using appropriate terminology.

Performance Level	Descriptors for Physical Science Content Strand **Strand 2: Physical Science**
Advanced	2e. Predict the effect of pH, temperature, and concentration on enzymatic reaction rates. 2f. Explain how energy from ATP is made available for specific processes in an organism, such as in the sodium-potassium pump.
Proficient	2a. Explain and compare the types of bonds between atoms based on the subatomic particles and their arrangement; connect the importance of ions to biological process. 2b. Utilize the properties of water to defend water as an essential component of living systems. 2c. Classify solutions as acidic, basic or neutral and relate the significance of an organism's pH to its survival. 2d. Compare and contrast the four major organic macromolecules in terms of structure, and function in living organisms. 2e. Explain the role enzymes play in regulating biochemical reactions. 2f. Describe the structure and function of ATP and its role in making energy available to the cell. 2g. Analyze and connect the roles of reactants and products in the biochemical process of photosynthesis and cellular respiration.
Basic	2a. Identify types of bond formation (e.g. covalent, ionic, hydrogen, etc.) 2b. Identify the unique properties of water. 2d. Identify examples of carbohydrates, proteins, lipids, and nucleic acids.

Performance Level	Descriptors for Life Science Content Strand **Strand 3: Life Science**
Advanced	3a. Evaluate the relationship between the adaptations of organisms to the biome in which they live. 3c. Predict possible adaptations and impacts that will occur when an organism is introduced in a new environment. 4d. Analyze how plant structures and cellular functions are related to survival of plants. 5b. Predict the results of a given parental dihybrid cross. 5c. Analyze a pedigree to determine unknown traits and genotypes in past or future generations. 6a. Given an organism, predict its evolutionary relationship to other given species.
Proficient	3a. Compare and contrast plant and animal species, climate, and adaptations of organisms found in the world's major biomes. 3b. Provide examples that demonstrate the interdependence of organisms and their environment (biotic and abiotic). 3c. Evaluate the significance of natural events and human activities on the biosphere. 4a. Differentiate among types of cells and describe the functions and structures of major cell organelles including cell parts for mobility. 4b. Differentiate between the types of cellular reproduction and the results of each type. 4c. Differentiate among the organizational levels of organisms. 4d. Explain and describe how vascular and nonvascular plant structures and cellular functions are related to the survival of plants. 5a. Analyze and explain the molecular basis of heredity and the inheritance of traits to successive generations using the Central Dogma of Molecular Biology. 5b. Utilize Mendel's laws and Punnett squares to evaluate results and predict percentage outcomes of monohybrid crosses involving complete dominance, incomplete dominance, codominance, sex-linked, and multiple alleles. 5c. Examine inheritance patterns using current technology. 5d. Describe the characteristics and implications of both chromosomal and gene mutations. 6a. Draw conclusions about how organisms are classified into hierarchy of groups and sub groups based on similarities that reflect their evolutionary relationships (including body plans and methods of reproduction). 6b. Critique data used by scientists (e.g. Redi, Needham, Spallanzani, and Pasteur) to explain evolutionary processes and patterns. 6c. Analyze research in relation to the contributions of scientists whose work led to the development of the theory of evolution. 6d. Analyze and explain the role of natural selection in speciation and applications of speciation. 6e. Differentiate among chemical evolution, organic evolution, and the evolutionary steps along the way to aerobic heterotrophs and photosynthetic autotrophs.

Basic	3a. Identify the major biomes and their characteristics. 4a. Identify the function of basic cell organelles. 5a. Label the structure of DNA and explain the differences between DNA and RNA. 5d. Identify types of chromosomal and gene mutations. 6a. List the taxonomic levels from broadest to specific and place organisms into the correct kingdom based on characteristics. 6c. Summarize the contributions of scientists whose work led to the development of the theory of evolution. 6d. Identify examples that demonstrate the role that natural selection, speciation, diversity, adaptation, and extinction play a role in evolution.