**OFFICE OF QUALITY PROFESSIONALS AND SPECIAL SCHOOLS**
**Summary of State Board of Education Agenda Items**
**June 21-22, 2007**

EDUCATOR LICENSURE

25. Approval to begin the Administrative Procedures Act Process: To Amend the Passing Score for the Praxis II Test in Biology as Recommended by the Commission on Teacher and Administrator Education, Certification and Licensure Development

Specifications:

On May 4, 2007, the Certification Commission voted to lower the cut score for the Praxis II test 0235 in Biology from 150 to 142.

Rationale:

A panel of certified Biology instructors and higher education personnel met on March 20, 2007, to evaluate the current cut score for the Praxis II test 0235 for Biology. This test is required for all Biology teachers, both traditional and alternate route. Biology is one of the critical shortage subject areas and MS has a difficult time certifying Biology teachers. The current cut score is 150 and for several years, we have had 20 – 26% passage rate with that score. The review panel is recommending to the Commission that the approved cut score be lowered to 142.

The report from the Biology review panel and the Educational Testing Service (ETS) data on state test scores is attached. The Mississippi 2004-2005 testing year reported 29% of those who took the biology exam made a passing score. In the Mississippi 2005-2006 testing year, 31% of those who took the biology exam made a passing score. These percentages were significant by being the lowest percentages made on any tested subject area for the state of Mississippi for those two school years. Another significant finding within the data was the national median score for African Americans. The score was a 141. Minority recruitment and filling the critical shortage subject area teaching positions are two of the major concerns when considering the lowering of the Biology test score.

Backup Material: Attached

Recommendation: Approval

JUCATOR LICENSURE

25. Approval to begin the Administrative Procedures Act Process: To Amend the Passing Score for t Praxis II Test in Biology as Recommended by the Commission on Teacher and Administrator Educatic Certification and Licensure Development

**MISSISSIPPI DEPARTMENT OF EDUCATION**
**JACKSON, MISSISSIPPI**
**MARCH 20, 2007**

**Participants**

**Mississippi Score Setting Study (SSS) Biology Panelists**
Tom Williams, Teacher Education Department Chair, Mississippi College
Larry Sullivan, Teacher, Saint Joseph Catholic High School
Angie Freeman, Teacher, Mize Attendance Center
Grace Awantang, Teacher, Raymond High School
Tambria Neal, Teacher, Terry High School

**Mississippi Department of Education Staff**
indy Coon, Director of Educator Licensure
Cindy Chester, Special Projects Officer

**ETS Staff**
Katherine Bassett, Director, Client Relations, Praxis
Cory Murphy, Director, Client Relations, Praxis

**PURPOSE OF MEETING**
The purpose of this meeting was to review state specific data generated for the Praxis I I Biology: Content Knowledge and School Leaders Licensure Assessment used for licensing teachers and administrators in the state of Mississippi respectively. This was done in an effort to yield a recommended passing score for final approval by the Mississippi State Board of Education. Prior to the score review, panelists were presented a brief overview of the test development process. This was completed to provide the attendees with background information as to how we had arrived at the role that they were called together to play in the test adoption process. Discussion of the two tests reviewed is available in the subsequent sections below.

**MEETING PROCEDURE**

The meeting proceeded in accordance with the following agenda:
**'ology Panel**
00 Welcome and Introductions

9:30 Overview of Steps to Test Development and State Adoption Process

10:15 Distribution, Review, and Discussion of Score Setting Study Materials

?:00 Adjourn

## Discussion and Recommendations

**Biology: Content Knowledge (Recommended Score: 142)**
The panelists began the discussion by stating that, because of such a high failure rate and critical need of teachers in the area of biology, the current passing score must be lowered. The panelists further stated that the state is losing a large number of prospective minority biology teachers because of their inability to successfully challenge the exam at its current passing score. Panelists felt that the state has been losing prospective teachers of biology to surrounding states, which provide other means of meeting licensure requirements. After extensive discussion, the score review process began.

First, panelists reviewed the *TAAG (Test at a Glance)* provided for test 0235. Second, test information sheets and three year rolling data were distributed and discussed. Third, this is a test that is currently bein used by the state therefore, state specific data were reviewed. Fourth, panelists reviewed and discussed t recommended study value plus -1 & -2 SEM data information provided from the standard setting study tha was conducted for the biology assessment.

The recommended score range yielded from the SSS (Mississippi Score Setting Study) as from a -1 SEM of 145 to a -2 SEM of 140. The consensus of the group was to make the recommendation to adopt the study value of 142. The panelists arrived at this conclusion noting the llowing:

- Recommendation that the state reviews the test performance after one to two years;
- State does not have a sufficient supply of minority biology teachers;
- Comparison to the existing test score indicated that a score of 142 would yield a higher pass rate according to the three year rolling national data presented;
- This is considered a critical need subject area for the state; the recommended score would allow more minorities access to the profession and eventually increase the pool of certified traditionally and alternatively prepared candidates.

## Next Steps

- The reports from all score setting studies with recommendations will be forwarded to the Mississippi Department of Education personnel to undergo their score adoption protocol.
- After receiving final approval by the state board of education, test adoption forms will be forwarded to and completed by the state department.
- Ms. Bassett has informed Ms. Florence Cucchi, who is coordinating the SLLA revision process for the Client Relations team, of the concerns of this panel. Ms. Cucchi will ascertain whether or not an item writing panel will be used for SLLA. She will also provide Mr. Murphy with a PowerPoint presentation to use as the basis for a presentation at the Dean's meeting to update the Deans on the revision work on the SLLA.

THE PRAXIS SERIES

# Biology: Content Knowledge (0235)

## Test at a Glance

| | |
|---|---|
| Test Name | Biology: Content Knowledge |
| Test Code | 0235 |
| Time | 2 hours |
| Number of Questions | 150 |
| Format | Multiple-choice questions |

| | Content Categories | Approximate Number of Questions | Approximate Percentage of Examination |
|---|---|---|---|
| I. | Basic Principles of Science | 12 | 8% |
| II. | Molecular and Cellular Biology | 38 | 25% |
| III. | Classical Genetics and Evolution | 23 | 15% |
| IV. | Diversity of Life, Plants, and Animals | 45 | 30% |
| V. | Ecology | 22 | 15% |
| VI. | Science, Technology, and Society | 10 | 7% |

## About This Test

The Biology: Content Knowledge test is designed to assess whether an examinee has the knowledge and competencies necessary for a beginning teacher of biology in a secondary school. The development of the test questions and the construction of the test reflect the National Science Education Standards and recognize that there are conceptual and procedural schemes that unify the various scientific disciplines. The 150 multiple-choice questions address examinees' knowledge of the biological sciences, the basic principles of science, and the issues and applications concerning science, technology, and society. Questions are derived from topics typically covered in an introductory college-level biology course. Within these content areas, the test questions require a variety of abilities and knowledge, including definition of terms, comprehension of critical concepts, and application and analysis, to address and solve problems.



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# Topics Covered

Representative descriptions of topics covered in each category are provided below.

I. Basic Principles of Science (History and Natural Science)

- Nature of scientific knowledge, inquiry, and historical perspectives:
  - scientific methods
  - processes involved in scientific inquiry
  - process skills, facts, concepts, models, commonly shared scientific ideals, history, and philosophy
  - contributions made by major historical figures and landmark events in the field of biology
- Mathematics, measurement, and data manipulation:
  - measurement and notation systems
  - data collection, manipulation, interpretation, and presentation, including tables, graphs, charts, and error analysis
- Laboratory procedures and safety:
  - safe preparation, storage, use, and disposal of laboratory and field materials
  - selection and use of appropriate laboratory equipment
  - legal responsibilities of the teacher, and safety and emergency procedures for the science classroom and laboratories

II. Molecular and Cellular Biology

- Chemical basis of life:
  - basic chemical structures
  - atoms, molecules, and chemical bonds
  - buffers
  - pH
  - biologically important molecules
  - thermodynamics and free energy
  - cellular bioenergetics
  - photosynthesis
  - respiration
  - enzymes
- Cell structure and function:
  - membranes, organelles, and subcellular components of prokaryotic and eukaryotic cells
  - cell cycle and cytokinesis
  - mitosis and meiosis
- Molecular basis of heredity:
  - structure and function of nucleic acids
  - DNA replication
  - protein synthesis
  - gene regulation
  - mutation and transposable elements
  - viruses
  - molecular basis of genetic diseases, e.g., cancer, sickle-cell anemia, hemophilia
  - recombinant DNA and genetic engineering
  - genome mapping of humans and other organisms

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I. Classical Genetics and Evolution
- Classical genetics: Mendelian and non-Mendelian inheritance, probability, linkage, human genetic disorders, interaction between heredity and the environment
- Evolution: evidence, mechanisms, population genetics, speciation, phylogeny, origin of life, species extinction

IV. Diversity of Life, Plants, and Animals
- Diversity of life: five-kingdom system, classification schemes, and characteristics and representatives of kingdoms
- Plants:
  - evolution, including adaptation to land and major divisions
  - anatomy, including roots, stems, leaves, and reproductive structures
  - physiology, including C3 and C4 photosynthesis, hormones, photoperiods, water and nutrient uptake, and translocation
  - reproduction, including alternation of generations, fertilization and zygote formation, dispersal, germination, growth and differentiation, and vegetative propagation
- Animals:
  - evolution, including phylogeny and classification, and major phyla
  - life functions and associated structures, including digestion, circulation, respiration, excretion, nervous control, contractile systems and movement, support, integument, immunity, and the endocrine system
  - reproduction and development, including gametogenesis, fertilization, parthenogenesis, embryogenesis, growth and differentiation, metamorphosis, and aging
  - behavior, including taxes, instincts, learned behaviors, and communication

V. Ecology
- Populations: intraspecific competition, density factors, population growth, dispersion patterns, life-history patterns, social behavior
- Communities: niche, interspecific relationships, species diversity, succession
- Ecosystems: terrestrial ecosystems, aquatic ecosystems, biomes, energy flow, biogeochemical cycles, stability and disturbances, human impact, interrelationships among ecosystems

VI. Science, Technology, and Society
- Impact of science and technology on the environment and human affairs
- Human and nature-induced hazards
- Issues and applications: production, storage, use, management, and disposal of consumer products and energy, and management of natural resources
- Social, political, ethical, and economic issues in biology
- Societal issues with health and medical advances



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# Sample Test Questions

*The sample questions that follow illustrate the types of questions in the test. They are not, however, representative of the entire scope of the test in either content or difficulty. Answers with explanations follow the questions.*

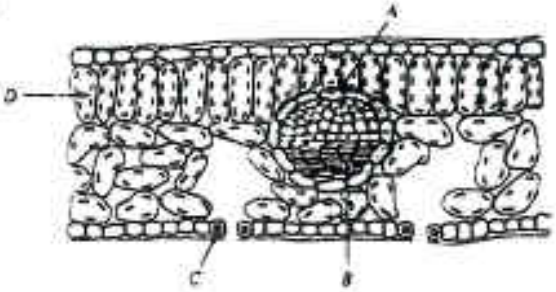
Directions: Each of the questions or incomplete statements below is followed by four suggested answers or completions. Select the one that is best in each case.

1. Two parents who do not exhibit phenylketonuria (PKU) have a son with PKU. Which of the following conclusions can be drawn from this situation?

   (A) The allele for PKU is located on the Y chromosome.
   (B) PKU is a dominant trait.
   (C) PKU is a recessive trait.
   (D) A mutation occurred in the sperm of the son.

2. All of the following represent primary consumers feeding on organisms in the first trophic level EXCEPT

   (A) paramecia feeding on green algae
   (B) mice feeding on dead grass
   (C) deer feeding on branches of trees
   (D) slugs feeding on mushrooms

3. 


   The diagram above represents a cross section of a leaf. Which region serves primarily to regulate the stomatal opening?

   (A) A
   (B) B
   (C) C
   (D) D

4. Which of the following best describes the pathway of a protein from its manufacture to its release from the cell?

   (A) Endoplasmic reticulum → Golgi complex → secretory vesicle
   (B) Secretory vesicle → endoplasmic reticulum → Golgi complex
   (C) Secretory vesicle → Golgi complex → endoplasmic reticulum
   (D) Golgi complex → endoplasmic reticulum → secretory vesicle

5. All of the following are likely to result from cutting down large areas of tropical rain forests EXCEPT

   (A) an increase in the species diversity of the areas
   (B) an increase in erosion by rivers flowing through the areas
   (C) an increase in the rate of nutrient loss from the areas
   (D) an increase in the percentage of carbon dioxide in the air

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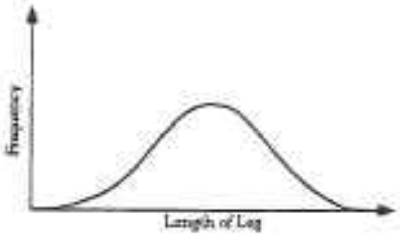
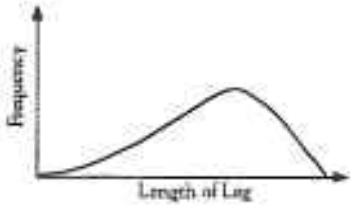
6.

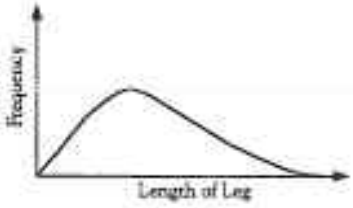



The graph above depicts the frequency of expression of the range of leg lengths in a population of grazing animals. In this species, leg length is directly related to speed, which is a heritable characteristic. These grazers are being preyed on by a newly introduced species of swift-running predators. Which of the following graphs represents the range of expression most likely to result from this selection pressure over a long period of time?

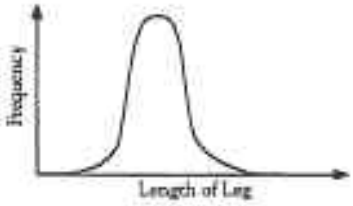
(A)



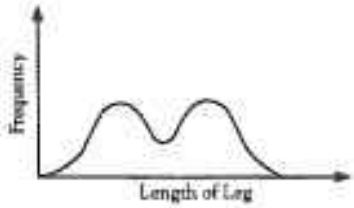

(B)




(C)



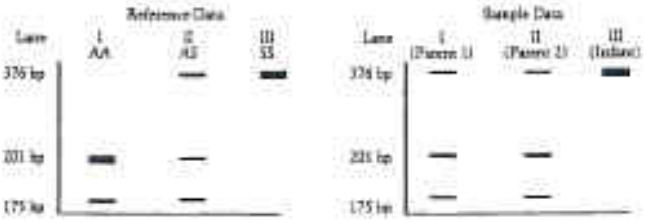

(D)




Directions for Questions 7–8: The group of questions below concerns an experimental situation. First study the description of the situation; then choose the one best answer to each question and fill in completely the space on the answer sheet.

Sickle cell anemia is a genetic disorder. Specialized techniques for DNA analysis are used to detect carriers of the sickle cell anemia allele and infants that are homozygous for the trait. The DNA is cut into fragments that are separated according to size by use of gel electrophoresis. Radiolabeled probes can then be used to identify both the normal gene sequence and the mutant (sickle cell) gene.

The reference data shown below indicate that the DNA in lane I is from a noncarrier (*AA*), the DNA in lane II is from a carrier (*AS*), and the DNA in lane III is from an individual having sickle cell anemia (*SS*). The sample data are from two parents (lanes I and II) and their infant (lane III).




7. Which of the following is correct concerning the sickle cell trait in Parent 1 (lane I)?

(A) Parent 1 is a carrier (*AS*).
(B) Parent 1 is a noncarrier (*AA*).
(C) Parent 1 has sickle cell anemia (*SS*).
(D) The occurrence of the sickle cell trait cannot be determined from the data.



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8. Which of the following can be concluded from the sample data?
   (A) The infant is homozygous for the sickle cell allele (*SS*).
   (B) The infant is a carrier of the sickle cell allele (*AS*).
   (C) The infant is a noncarrier of the sickle cell allele (*AA*).
   (D) The occurrence of the sickle cell trait cannot be determined for the infant.

Directions for Questions 9–10: The group of questions below consists of four lettered headings followed by a list of phrases or sentences. For each sentence, select the one heading that is most closely related to it. One heading may be used once, more than once, or not at all.

(A) Nephrons
(B) Flame cells
(C) Malpighian tubules
(D) Skin gills

9. Function in both arachnids and insects

10. Have cilia to guide waste products to excretory pores



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# Answers

1. The correct answer is C. PKU must be a recessive trait because the parents did not exhibit the disorder yet must have been carriers for the disorder.

2. The correct answer is D. The first trophic level consists of producers. Neither slugs nor mushrooms are producers. In choices A, B, and C, the producers are green algae, dead grass, and tree branches, and the primary consumers are paramecia, mice, and deer.

3. The correct answer is C. These are the guard cells that regulate the stomatal opening.

4. The correct answer is A. Proteins pass from the ribosomes into the lumen of the endoplasmic reticulum. They are then sent to the Golgi complex, where they are modified and packaged into vesicles, which transport them to the outside of the cell.

5. Choice A is the exception. The continuing loss of the incredibly diverse habitats found in tropical rain forests will cause a decrease in species diversity, not an increase. Thus, A is the correct answer.

6. The correct answer is A. Selection pressure would favor longer legs in the prey animals, and choice A depicts a population with a large number of individuals with longer legs.

7. The correct answer is A. By comparing the data from Parent 1 to the reference data, it is clear that Parent 1 is a carrier (AS).

8. The correct answer is A. The infant is homozygous for the sickle cell allele. This can be seen by comparing lane III of the reference data with lane III of the sample data.

9. The correct answer is C. Malpighian tubules are found in arthropods.

10. The correct answer is B. Flame cells contain cilia.

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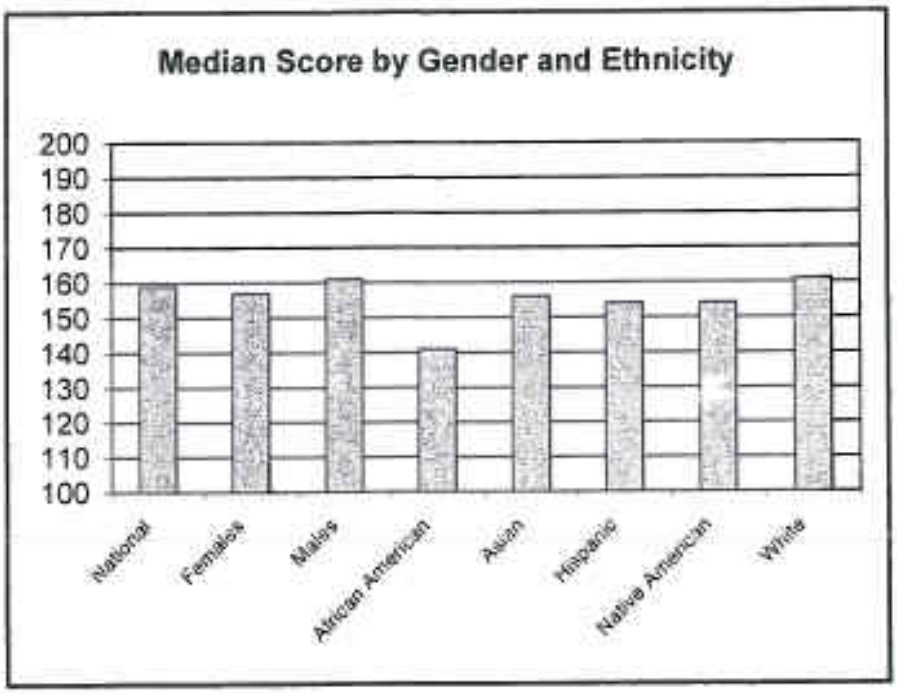
# Test Information - 2005-2006 Total Examinees

*September 1, 2005-August 31, 2006*

| TEST CODE | 0235 | TEST NAME | Biology: Content Knowledge |
|---|---|---|---|

| COUNTS | GENDER | | ETHNICITY | | | | |
|---|---|---|---|---|---|---|---|
| Total | Females | Males | African American | Asian | Hispanic | Native American | White |
| 4,840 | 3,198 | 1,468 | 651 | 142 | 67 | 29 | 3,408 |

| MEDIAN SCORE | |
|---|---|
| National | 159 |
| Females | 157 |
| Males | 161 |
| African American | 141 |
| Asian | 156 |
| Hispanic | 154 |
| Native American | 154 |
| White | 161 |




*Scores in Effect as of 1/1/07*

| STATE | PASSING SCORE |
|---|---|
| Delaware | 157 |
| Virginia | 155 |
| Indiana | 154 |
| New Hampshire | 153 |
| North Dakota | 153 |
| Connecticut | 152 |
| Minnesota | 152 |
| Washington | 152 |
| West Virginia | 152 |
| District of Columbia | 150 |
| Georgia | 150 |
| Kansas | 150 |
| Louisiana | 150 |
| Maine | 150 |
| Maryland | 150 |
| Mississippi | 150 |
| Missouri | 150 |
| Utah | 149 |
| Ohio | 148 |
| Tennessee | 148 |
| Pennsylvania | 147 |
| South Dakota | 147 |
| Kentucky | 146 |
| Alabama | 142 |
| Arkansas | 142 |
| Alaska | 139 |
| Idaho | 139 |

**NOTES:**
State passing scores listed in the table do not include states that use multiple passing scores, multiple test composite scores or states that have no minimum passing score.

A state and score listed in *Italics* indicates a score used for Highly Qualified Status Only.

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