ACTAAP

Arkansas Comprehensive Testing, Assessment, and Accountability Program

Released Item Booklet

Biology End-of-Course Examination

2014–2015 Administrations

Arkansas Department of Education

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PART I OVERVIEW

The criterion-referenced tests implemented as part of the **Arkansas Comprehensive Testing, Assessment, and Accountability Program** (ACTAAP) are being developed in response to Arkansas Legislative Act 35, which requires the State Board of Education to develop a comprehensive testing program that includes assessment of the challenging academic content standards defined by the Arkansas Curriculum Frameworks.

As part of this program, students in Arkansas public schools in 2015 who had completed or were completing Biology by the end of first semester participated in the *Mid-Year Biology End-of-Course Examination*. Students in Arkansas public schools who had completed or were completing Biology by the end of the spring semester participated in the *Spring Biology End-of-Course Examination*.

This Released Item Booklet for the Biology End-of-Course Examination contains test questions or items that were asked of students during the 2014–2015 operational administrations. The test items included in Part II of this booklet are some of the items that contributed to the student performance results for these administrations.

Students were given approximately an hour and a half each day to complete assigned test sessions during the two days of Mid-Year testing and approximately two hours each day to complete assigned test sessions during the two days of Spring testing. All of the multiple-choice items within this booklet have the correct response marked with an asterisk (*).

The development of the Biology End-of-Course Examination was based on the *Arkansas Biology Science Curriculum Framework*. This framework has distinct levels: Strands to be taught in concert, Content Standards within each Strand, and Student Learning Expectations within each Content Standard. An abridged version of the *Arkansas Biology Science Curriculum Framework* can be found in Part III of this booklet. It is important to note that this abridged version lists only the predominant Strand, Content Standard, and Student Learning Expectation associated with each item. However, since many key concepts within the *Arkansas Biology Science Curriculum Framework* are interrelated, there may be many cases in which there are other item correlations or associations across Strands, Content Standards, and Student Learning Expectations.

Part IV of the Released Item Booklet contains a tabular listing of the Strand, Content Standard, and Student Learning Expectation that each question was designed to assess. The multiple-choice and open-response items found on the Biology End-of-Course Examination were developed in close association with the Arkansas education community. Arkansas teachers participated as members of the Biology Content Advisory Committee, providing routine feedback and recommendations for all items. The number of items associated with specific Strands, Content Standards, and Student Learning Expectations was based on approximate proportions suggested by the Content Advisory Committee, and their recommendations were accommodated to the greatest extent possible given the overall test design. Part IV of the Released Item Booklet provides Arkansas educators with specific information on how Biology End-of-Course Examination items align or correlate with the *Arkansas Biology Science Curriculum Framework* to provide models for classroom instruction.

PART I Scoring Student Responses to Biology Open-Response Items

While multiple-choice items are scored by machine to determine if the student chose the correct answer from four options, responses to open-response items must be scored by trained "readers" using a pre-established set of scoring criteria. Readers are trained to score in only one content area. All readers who qualify for scoring the Biology End-of-Course Examination will have a four year college degree.

The Arkansas Biology Rangefinding Committee assisted in the development of the scoring criteria. The committee comprises active Arkansas educators with expertise in science education.

Reader Training

Before readers are allowed to begin assigning scores to any student responses, they go through intensive training. The first step in that training is for the readers to read the Biology open-response items as they appear in the test booklet and to respond—just as the student test takers are required to do. This step gives the readers some insight into how the students might have responded. The next step is the readers' introduction to the scoring rubric. All of the specific requirements of the rubric are explained by the Scoring Director who has been specifically trained to lead the scoring group. Then responses (anchor papers) that illustrate the score points of the rubric are presented to the readers and discussed. The goal of this discussion is for the readers to understand why a particular response (or type of response) receives a particular score. After discussion of the rubric and anchor papers, readers practice scoring sets of responses that have been prescored and selected for use as training papers. Detailed discussion of the responses and the scores they receive follows.

After three or four of these practice sets, readers are given "qualifying rounds." These are additional sets of prescored papers, and, in order to qualify, each reader scoring Biology responses must score in exact agreement on at least 80% of the responses. Readers who do not score within the required rate of agreement are not allowed to score the Biology End-of-Course Examination responses.

Once scoring of the actual student responses begins, readers are monitored constantly throughout the project to ensure that they are scoring according to the criteria. Daily and cumulative statistics are posted and analyzed, and Scoring Directors or Team Leaders reread selected responses scored by the readers. These procedures promote reliable and consistent scoring. Any reader who does not maintain an acceptable level of agreement is dismissed from the project.

Scoring Procedures

All student responses to the Biology End-of-Course Examination open-response test items are scored independently by two readers. Those two scores are compared, and responses that receive scores that are non-adjacent (a "1" and a "3," for example) are scored a third time by a Team Leader or the Scoring Director for resolution.

Note: For this administration, no items were released from the Mid-Year Biology End-of-Course Examination. For that reason Part II does not included Mid-Year Released Items as it has in previous years.

PART II Spring Released Biology Items

1. Gregor Mendel crossed a purebred purple-flowered pea plant with a purebred white-flowered pea plant. The offspring all expressed the purple phenotype.

Which of Mendel's Laws of Inheritance would predict this result?

*A. dominance
B. segregation
C. incomplete dominance
D. independent assortment

2. In some rabbit populations, short hair is an autosomal recessive trait.

Which cross would **most** likely result in 50% long-haired rabbits and 50% short-haired rabbits?

*A. Ll x ll
B. LL x ll
C. Ll x Ll
D. LL x Ll

3. Which **best** describes a characteristic of scientific study?

A. Science can prove all ideas thought up by humans.
B. Science can provide answers to all questions about nature.
C. Science is based on a specific series of steps to be followed.
*D. Science provides possible explanations for observable events.

4. Which is true regarding Darwin and Lamarck's ideas about evolution?

A. Darwin hypothesized that evolution occurred by artificial selection. Lamarck hypothesized that evolution occurred by natural selection.
B. Darwin hypothesized that evolution occurred by acquired inheritance. Lamarck hypothesized that evolution occurred by genetic inheritance.
*C. Darwin hypothesized that evolution occurred by natural selection. Lamarck hypothesized that evolution occurred by acquired inheritance.
D. Darwin hypothesized that evolution occurred by artificial selection. Lamarck hypothesized that evolution occurred by genetic inheritance.

5. Which is true regarding a scientific theory?

A. unchangeable explanation of natural events
*B. revised as new information becomes available
C. requires agreement by the whole scientific community
D. an absolutely certain conclusion about a specific event

6. Doctors used a reprogrammed form of human immunodeficiency virus (HIV) to combat leukemia. Once the reprogrammed HIV was injected into a patient's immune cells, the immune cells attacked the cancer cells and destroyed them.

Which quality of viruses allowed this therapy to occur?

*A. Viruses have genetic material that can be altered.

B. Viruses have the ability to reproduce independently.

C. Viruses have the capacity to infect a wide variety of organisms.

D. Viruses have an outer coat that alerts the inflammatory response.

7. A doctor knew that the parasite *Plasmodium* was always found in the blood of malaria patients. Upon further study, he learned that malaria was most common among populations where there was poor water quality, a lack of food, and very little shelter. When he found patients suffering from malaria, he often found that there were several people in the household who did not have the disease. He also found that *Anopheles* mosquitoes were common in these areas. He noted that the mosquitoes tested positive for *Plasmodium* as well.

Which statement is supported by the information above?

A. *Plasmodium* is effective in improving water quality.

B. *Plasmodium* is effective in killing *Anopheles* mosquitoes.

C. Malaria is spread by *Plasmodium* from human to human contact.

*D. Malaria is spread by *Plasmodium* found in *Anopheles* mosquitoes.

8. If two organisms are in the same class, which other taxonomic group do they have in common?

A. order

B. genus

C. family

*D. phylum

9. Two barnacle species attach to rocks and occupy the same shore habitat. In a study, Species X was removed from several locations while Species Y was left in place. During the next 18 months, Species Y expanded its range to fill the space where Species X had been removed.

According to the information above, which interaction with Species X normally controlled the population of Species Y?

A. predation
B. parasitism
*C. competition
D. commensalism

10. Which structure helps to maintain the shape of a cell?

A. ribosome
*B. cytoskeleton
C. mitochondrion
D. Golgi apparatus

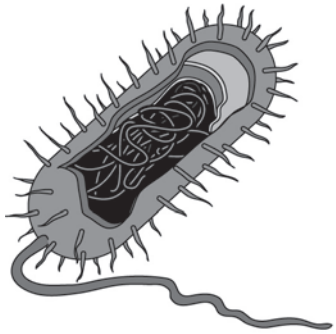
11. Which statement explains why nonvascular plants grow low to the ground?

*A. They lack water-transporting tissues.
B. They require sunlight for photosynthesis.
C. Their leaf-like structures are one cell thick.
D. Their spores are released directly into the water.

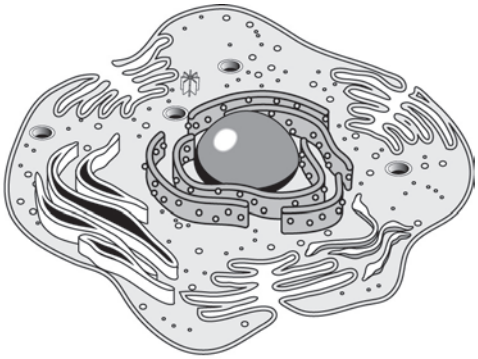
12. Which describes how primary succession is different from secondary succession?

*A. Primary succession begins on bare rock, while secondary succession begins on intact soil.
B. Primary succession brings organisms into the area, while secondary succession forces organisms out.
C. Primary succession occurs after a forest fire, while secondary succession occurs after a volcanic eruption.
D. Primary succession occurs in stable environments, while secondary succession occurs in environments that change constantly.

13. The illustrations below represent two different cells.



Cell 1



Cell 2

Which **best** describes the major difference between these cells?

A. Cell 1 is an autotroph, but Cell 2 is a heterotroph.

B. Cell 1 is a heterotroph, but Cell 2 is an autotroph.

C. Cell 1 has a membrane-bound nucleus, but Cell 2 lacks a membrane-bound nucleus.

*D. Cell 1 lacks a membrane-bound nucleus, but Cell 2 has a membrane-bound nucleus.

14. Which is a product of photosynthesis and a reactant in the process of cellular respiration?

A. protein
*B. oxygen
C. chlorophyll
D. carbon dioxide

15. Coral reefs are some of the most diverse ecosystems within the biosphere.

Which are biotic factors that contribute to this diversity?

A. warm water through which light passes
*B. abundant eggs and larvae as food sources
C. constant circulation of water and nutrients
D. temperatures that decrease as depth increases

A. The diagram below represents a simple food chain in a river ecosystem.

Algae → Small Fish → Large Fish → River Otter

1. Identify one factor that could limit the Large Fish population in the river ecosystem. Explain why this factor could limit the Large Fish population.

2. Identify one factor that could limit the Algae population in the river ecosystem. Explain why this factor could limit the Algae population.

3. The River Otter population in the river ecosystem is reduced by half. Predict how this reduction may affect one of the other populations in the food chain. Explain your answer.

4. Explain why the food chain above can sustain only a certain number of individuals in each population living in the river ecosystem.

BE SURE TO LABEL YOUR RESPONSES 1, 2, 3, AND 4.

Item A Scoring Rubric—2015 Biology

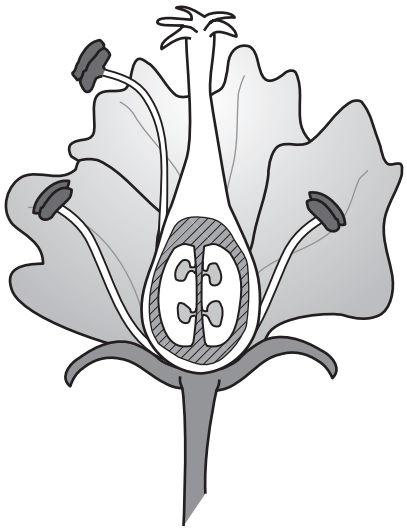
Parts	Points
1	**1 point possible:** 1 point: Identifies one factor that would limit the size of the large fish population in this food chain (½ point). Explains why this would occur (½ point).
2	**1 point possible:** 1 point: Identifies one factor that would limit the size of the population of algae in this food chain (½ point). Explains why this would occur (½ point).
3	**1 point possible:** 1 point: Predicts one change in the populations of other organisms if the river otter population was decreased by half (½ point). Explanation (½ point).
4	**1 point possible:** 1 point: Explains why the food chain above can only sustain a certain number of individuals in each population.

Score	Description
4	Response shows a *complete understanding* of identifying and predicting the factors that control populations. The student presents correct descriptions to all parts of the task.
3	Response shows a *nearly complete understanding* of identifying and predicting the factors that control populations. The student presents nearly all descriptions to all parts of the task. The response may contain minor errors.
2	Response shows a *limited understanding* of identifying and predicting the factors that control populations. The student presents some descriptions correctly to most parts of the task. The response may contain a major error.
1	Response shows a *minimal understanding* of identifying and predicting the factors that control populations. The student presents some descriptions. The response contains incomplete descriptions and major errors.
0	Response shows *insufficient understanding* of identifying and predicting the factors that control populations. The descriptions, if any, contain major errors. There may be no descriptions, or the reader may not be able to understand the explanation. The reader may not be able to understand how and why decisions were made.

Solution and Scoring

Parts	Points
1	**1 point possible:** ½ point for identifying one factor. ½ point for the explanation. Factors and explanations may include: · Less available food (fewer Small Fish) could reduce the number of Large Fish that survive and/or reproduce. · Introduction of a new disease organism could kill the Large Fish or prevent the reproduction of the Large Fish, or could kill the food source of the Large Fish (Small Fish). · Introduction of an invasive species could reduce the amount of food and other resources available for the Large Fish because an invasive species may compete with the Large Fish for these resources OR the invasive species could be a predator of the Large Fish. · Increased birthrate for River Otter could reduce the Large Fish population because of increased predation OR decreased birthrate for Small Fish could reduce the Large Fish population because of less available food. · Human interactions with Large Fish and/or their habitat such as overfishing, oil spills, pollution, acid rain, and boating may reduce the Large Fish population.
2	**1 point possible:** ½ point for identifying one factor. ½ point for the explanation. Factors and explanations may include: · A reduction in the amount of light will limit photosynthesis which the Algae need for energy for life processes. · A reduction in amount of nutrients limits the ability of the Algae to perform life processes. · Human interactions with Algae and/or their habitat such as pollution, oil spills, acid rain, and boating may kill Algae or prevent Algae from reproducing. · Increased populations of organisms (i.e., Small Fish) that feed on algae may cause Algae to be consumed faster than it can reproduce. Any factor that negatively affects the growth or reproduction of the Algae would tend to decrease the population of Algae, because it can only grow and reproduce normally if the resources it needs are plentiful in the environment.
3	**1 point possible:** ½ point for predicting one change. ½ point for the explanation. The Large Fish population may increase because of less predation by the River Otters. OR The Small Fish population may decrease because an increase in the Large Fish population (due to decreased predation of Large Fish by River Otters) may increase predation on Small Fish. OR The Algae population may increase because of a decrease in the Small Fish population (due to increased predation by Large Fish, due to decreased predation by River Otter).
4	**1 point possible:** 1 point for the explanation. A food chain sustains only a certain number of organisms because there is a limited amount of resources in an ecosystem such as food, water, shelter, and nutrients.

B. Look at the diagram of a flower below.



1. Identify a structure found in the diagram of the flower above.

2. Describe the function of the structure identified in Part 1.

3. Identify another structure found in the diagram of the flower above.

4. Describe the function of the structure identified in Part 3.

BE SURE TO LABEL YOUR RESPONSES 1, 2, 3, AND 4.

Item B Scoring Rubric—2015 Biology

Parts	Points
1	**1 point possible:** 1 point: Correctly identifies a structure in the diagram.
2	**1 point possible:** 1 point: Correctly describes the function of the structure identified in Part 1.
3	**1 point possible:** 1 point: Correctly identifies another structure in the diagram.
4	**1 point possible:** 1 point: Correctly describes the function of the structure identified in Part 3.

Score	Description
4	Response shows a *complete understanding* of describing the structure and function of the major parts of a plant. The student presents correct descriptions to all parts of the task.
3	Response shows a *nearly complete understanding* of describing the structure and function of the major parts of a plant. The student presents nearly all descriptions to all parts of the task. The response may contain minor errors.
2	Response shows a *limited understanding* of describing the structure and function of the major parts of a plant. The student presents some descriptions correctly to most parts of the task. The response may contain a major error.
1	Response shows a *minimal understanding* of describing the structure and function of the major parts of a plant. The student presents some descriptions. The response contains incomplete descriptions and major errors.
0	Response shows *insufficient understanding* of describing the structure and function of the major parts of a plant. The descriptions, if any, contain major errors. There may be no descriptions, or the reader may not be able to understand the explanation. The reader may not be able to understand how and why decisions were made.

PART II Spring Released Biology Items

Solution and Scoring

Part	Points
1 and 3	**1 point possible:** 1 point for correct identification. Structures include: Pistil, stigma, style, ovary, stamen, anther, filament, petal, sepal, peduncle, receptacle
2 and 4	**1 point possible:** 1 point for correct description of function. Functions of each flower structure: pistil - female part of the flower that consists of stigma, style, and ovary style - the stalk of a carpel through which the pollen tube grows stigma - top of carpel which serves as receptive surface for pollen ovary - base of carpel that contains ovules, female reproductive gametes; matures to become a fruit stamen - male part of the flower that makes pollen grains anther - the pollen bearing portion of the stamen filament - the stalk of the stamen that bears the anther petal - sometimes can produce nectar, but is usually colorful to attract pollinators to plant sepal - leaf-like structure that protects young flower bud peduncle - portion of flower stalk that bears the flower organs receptacle - flower stalk

The Arkansas Biology Science Curriculum Framework*

Strands	Content Standards	Student Learning Expectations
1. MOLECULES AND CELLS (MC)	1. Students shall demonstrate an understanding of the role of chemistry in life processes.	1. Describe the structure and function of the major organic molecules found in living systems: • carbohydrates • proteins • enzymes • lipids • nucleic acids 2. Describe the relationship between an enzyme and its substrate molecule(s). 4. Explain the role of energy in chemical reactions of living systems: • activation energy • exergonic reactions • endergonic reactions
	2. Students shall demonstrate an understanding of the structure and function of cells.	1. Construct a hierarchy of life from cells to ecosystems. 2. Compare and contrast prokaryotes and eukaryotes. 3. Describe the role of sub-cellular structures in the life of a cell: • organelles • ribosomes • cytoskeleton 5. Compare and contrast the structures of an animal cell to a plant cell. 6. Compare and contrast the functions of autotrophs and heterotrophs. 7. Compare and contrast active transport and passive transport mechanisms: • diffusion • osmosis • endocytosis • exocytosis • phagocytosis • pinocytosis 8. Describe the main events in the cell cycle, including the differences in plant and animal cell division: • interphase • mitosis • cytokinesis 9. List in order and describe the stages of mitosis: • prophase • metaphase • anaphase • telophase 10. Analyze the meiotic maintenance of a constant chromosome number from one generation to the next.
	3. Students shall demonstrate an understanding of how cells obtain and use energy (energetics).	2. Describe and model the conversion of stored energy in organic molecules into usable cellular energy (ATP): • glycolysis • citric acid cycle • electron transport chain 3. Compare and contrast aerobic and anaerobic respiration: • lactic acid fermentation • alcoholic fermentation 4. Describe and model the conversion of light energy to chemical energy by photosynthetic organisms: • light dependent reactions • light independent reactions 5. Compare and contrast cellular respiration and photosynthesis as energy conversion pathways.

*The Content Standards and Student Learning Expectations listed are those that specifically relate to the items in the *2015 Mid-Year* and *Spring Biology End-of-Course Examination.*

The Arkansas Biology Science Curriculum Framework*

Strands	Content Standards	Student Learning Expectations
2. HEREDITY AND EVOLUTION (HE)	4. Students shall demonstrate an understanding of heredity.	1. Summarize the outcomes of Gregor Mendel's experimental procedures. 2. Differentiate among the laws and principles of inheritance: • dominance • segregation • independent assortment 3. Use the laws of probability and Punnett squares to predict genotypic and phenotypic ratios. 4. Examine different modes of inheritance: • sex linkage • codominance • crossing over • incomplete dominance • multiple alleles 5. Analyze the historically significant work of prominent geneticists. 6. Evaluate karyotypes for abnormalities: • monosomy • trisomy
	5. Students shall investigate the molecular basis of genetics.	2. Describe the Watson-Crick double helix model of DNA, using the base-pairing rule (adenine-thymine, cytosine-guanine). 3. Compare and contrast the structure and function of DNA and RNA. 5. Compare and contrast the different types of mutation events, including point mutation, frameshift mutation, deletion, and inversion.
	6. Students shall examine the development of the theory of biological evolution.	1. Compare and contrast Lamarck's explanation of evolution with Darwin's theory of evolution by natural selection. 2. Recognize that evolution involves a change in allele frequencies in a population across successive generations. 3. Analyze the effects of mutations and the resulting variations within a population in terms of natural selection. 5. Evaluate evolution in terms of evidence as found in the following: • fossil record • DNA analysis • artificial selection • morphology • embryology • viral evolution • geographic distribution of related species • antibiotic and pesticide resistance in various organisms 7. Interpret a Cladogram.

*The Content Standards and Student Learning Expectations listed are those that specifically relate to the items in the *2015 Mid-Year* and *Spring Biology End-of-Course Examination.*

The Arkansas Biology Science Curriculum Framework*

Strands	Content Standards	Student Learning Expectations
3. CLASSIFICATION AND THE DIVERSITY OF LIFE (CDL)	7. Students shall demonstrate an understanding that organisms are diverse.	1. Differentiate among the different domains: • Bacteria • Archaea • Eukarya 3. Identify the seven major taxonomic categories: • kingdom • phylum • class • order • family • genus • species 4. Classify and name organisms based on their similarities and differences applying taxonomic nomenclature using dichotomous keys. 5. Investigate Arkansas' biodiversity using appropriate tools and technology. 6. Compare and contrast the structures and characteristics of viruses (lytic and lysogenic cycles) with non-living and living things. 7. Evaluate the medical and economic importance of viruses. 8. Compare and contrast life cycles of familiar organisms: • sexual reproduction • asexual reproduction • metamorphosis • alternation of generations 10. Evaluate the medical and economic importance of bacteria. 14. Evaluate the medical and economic importance of fungi. 15. Differentiate between vascular and nonvascular plants. 16. Differentiate among cycads, gymnosperms, and angiosperms. 17. Describe the structure and function of the major parts of a plant: • roots • stems • leaves • flowers 18. Relate the structure of plant tissue to its function: • epidermal • ground • vascular 19. Evaluate the medical and economic importance of plants. 20. Identify the symmetry of organisms: • radial • bilateral • asymmetrical

*The Content Standards and Student Learning Expectations listed are those that specifically relate to the items in the *2015 Mid-Year* and *Spring Biology End-of-Course Examination.*

The Arkansas Biology Science Curriculum Framework*

Strands	Content Standards	Student Learning Expectations
4. ECOLOGY AND BEHAVIORAL RELATIONSHIPS (EBR)	8. Students shall demonstrate an understanding of ecological and behavioral relationships among organisms.	1. Cite examples of abiotic and biotic factors of ecosystems. 2. Compare and contrast the characteristics of biomes. 3. Diagram the carbon, nitrogen, phosphate, and water cycles in an ecosystem. 4. Analyze an ecosystem's energy flow through food chains, food webs, and energy pyramids. 5. Identify and predict the factors that control population, including predation, competition, crowding, water, nutrients, and shelter. 6. Summarize the symbiotic ways in which individuals within a community interact with each other: • commensalism • parasitism • mutualism 7. Compare and contrast primary succession with secondary succession. 8. Identify the properties of each of the five levels of ecology: • organism • population • community • ecosystem • biosphere
	9. Students shall demonstrate an understanding of the ecological impact of global issues.	1. Analyze the effects of human population growth and technology on the environment/biosphere. 3. Assess current world issues applying scientific themes (e.g., global changes in climate, epidemics, pandemics, ozone depletion, UV radiation, natural resources, use of technology, and public policy).

*The Content Standards and Student Learning Expectations listed are those that specifically relate to the items in the *2015 Mid-Year* and *Spring Biology End-of-Course Examination.*

The Arkansas Biology Science Curriculum Framework*

Strands	Content Standards	Student Learning Expectations
5. NATURE OF SCIENCE (NS)	10. Students shall demonstrate an understanding that science is a way of knowing.	1. Explain why science is limited to natural explanations of how the world works. 2. Compare and contrast hypotheses, theories, and laws. 4. Summarize the guidelines of science: • explanations are based on observations, evidence, and testing • hypotheses must be testable • understandings and/or conclusions may change with additional empirical data • scientific knowledge must have peer review and verification before acceptance
	11. Students shall design and safely conduct a scientific inquiry to solve valid problems.	3. Identify sources of bias that could affect experimental outcome. 4. Gather and analyze data using appropriate summary statistics. 5. Formulate valid conclusions without bias. 6. Communicate experimental results using appropriate reports, figures, and tables.
	12. Students shall demonstrate an understanding of current life science theories.	1. Recognize that theories are scientific explanations that require empirical data, verification, and peer review. 2. Understand that scientific theories may be modified or expanded based on additional empirical data, verification, and peer review. 4. Relate the development of the cell theory to current trends in cellular biology. 5. Describe the relationship between the germ theory of disease and our current knowledge of immunology and control of infectious diseases.
	13. Students shall use mathematics, science equipment, and technology as tools to communicate and solve life science problems.	1. Collect and analyze scientific data using appropriate mathematical calculations, figures, and tables.
	14. Students shall describe the connections between pure and applied science.	2. Discuss why scientists should work within ethical parameters. 3. Evaluate long-range plans concerning resource use and by-product disposal for environmental, economic, and political impact.

*The Content Standards and Student Learning Expectations listed are those that specifically relate to the items in the *2015 Mid-Year* and *Spring Biology End-of-Course Examination.*

PART IV Item Correlation with Curriculum Framework

Mid-Year Non-Released Biology Items

Strands	Content Standards
1— Molecules and Cells (MC)	1. Students shall demonstrate an understanding of the role of chemistry in life processes. 2. Students shall demonstrate an understanding of the structure and function of cells. 3. Students shall demonstrate an understanding of how cells obtain and use energy (energetics).
2— Heredity and Evolution (HE)	4. Students shall demonstrate an understanding of heredity. 5. Students shall investigate the molecular basis of genetics. 6. Students shall examine the development of the theory of biological evolution.
3— Classification and the Diversity of Life (CDL)	7. Students shall demonstrate an understanding that organisms are diverse.
4— Ecology and Behavioral Relationships (EBR)	8. Students shall demonstrate an understanding of ecological and behavioral relationships among organisms. 9. Students shall demonstrate an understanding of the ecological impact of global issues.
5— Nature of Science (NS)	10. Students shall demonstrate an understanding that science is a way of knowing. 11. Students shall design and safely conduct a scientific inquiry to solve valid problems. 12. Students shall demonstrate an understanding of current life science theories. 13. Students shall use mathematics, science equipment, and technology as tools to communicate and solve life science problems. 14. Students shall describe the connections between pure and applied science.

Strand	Content Standard	Student Learning Expectation
MC	2	1
HE	4	1
CDL	7	17
EBR	9	3
NS	10	4
MC	1	1
HE	6	5
CDL	7	8
EBR	8	6
NS	11	4
MC	2	2
HE	5	3
CDL	7	10
EBR	8	7
NS	11	3
MC	2	5
HE	4	3
CDL	7	15
EBR	8	5
NS	10	2
MC	3	3
HE	6	3
CDL	7	15
EBR	8	3
NS	12	4
MC	3	2
HE	6	3
CDL	7	19
EBR	8	3
NS	12	2

Mid-Year Non-Released Biology Items

Strand	Content Standard	Student Learning Expectation
EBR	8	4
HE	4	1
CDL	7	16
MC	1	4
HE	5	2
CDL	7	9
EBR	8	4
NS	11	6
MC	3	4
HE	5	3
CDL	7	4
EBR	8	6
NS	13	1
MC	2	10
HE	6	2
CDL	7	3
EBR	8	5
NS	14	2
MC	2	6
HE	4	4
CDL	7	6
EBR	8	2
NS	10	1
MC	3	5
HE	5	5
CDL	7	1
EBR	8	1
NS	12	1
MC	2	7
HE	6	7
CDL	7	15
EBR	8	6
NS	12	2
MC	2	6
NS	13	1

PART IV ITEM CORRELATION WITH CURRICULUM FRAMEWORK

Spring Released Biology Items

Strands	Content Standards
1— MOLECULES AND CELLS (MC)	2. Students shall demonstrate an understanding of the structure and function of cells. 3. Students shall demonstrate an understanding of how cells obtain and use energy (energetics).
2— HEREDITY AND EVOLUTION (HE)	4. Students shall demonstrate an understanding of heredity. 6. Students shall examine the development of the theory of biological evolution.
3— CLASSIFICATION AND THE DIVERSITY OF LIFE (CDL)	7. Students shall demonstrate an understanding that organisms are diverse.
4— ECOLOGY AND BEHAVIORAL RELATIONSHIPS (EBR)	8. Students shall demonstrate an understanding of ecological and behavioral relationships among organisms.
5— NATURE OF SCIENCE (NS)	10. Students shall demonstrate an understanding that science is a way of knowing. 11. Students shall design and safely conduct a scientific inquiry to solve valid problems. 12. Students shall demonstrate an understanding of current life science theories.

Item	Strand	Content Standard	Student Learning Expectation
1	HE	4	2
2	HE	4	3
3	NS	10	1
4	HE	6	1
5	NS	12	2
6	CDL	7	7
7	NS	11	5
8	CDL	7	3
9	EBR	8	5
10	MC	2	3
11	CDL	7	15
12	EBR	8	7
13	MC	2	2
14	MC	3	5
15	EBR	8	1
A	EBR	8	5
B	CDL	7	17

PART IV ITEM CORRELATION WITH CURRICULUM FRAMEWORK

Spring Non-Released Biology Items

Strands	Content Standards
1— MOLECULES AND CELLS (MC)	1. Students shall demonstrate an understanding of the role of chemistry in life processes. 2. Students shall demonstrate an understanding of the structure and function of cells. 3. Students shall demonstrate an understanding of how cells obtain and use energy (energetics).
2— HEREDITY AND EVOLUTION (HE)	4. Students shall demonstrate an understanding of heredity. 5. Students shall investigate the molecular basis of genetics. 6. Students shall examine the development of the theory of biological evolution.
3— CLASSIFICATION AND THE DIVERSITY OF LIFE (CDL)	7. Students shall demonstrate an understanding that organisms are diverse.
4— ECOLOGY AND BEHAVIORAL RELATIONSHIPS (EBR)	8. Students shall demonstrate an understanding of ecological and behavioral relationships among organisms. 9. Students shall demonstrate an understanding of the ecological impact of global issues.
5— NATURE OF SCIENCE (NS)	10. Students shall demonstrate an understanding that science is a way of knowing. 11. Students shall design and safely conduct a scientific inquiry to solve valid problems. 12. Students shall demonstrate an understanding of current life science theories. 13. Students shall use mathematics, science equipment, and technology as tools to communicate and solve life science problems. 14. Students shall describe the connections between pure and applied science.

PART IV ITEM CORRELATION WITH CURRICULUM FRAMEWORK

Spring Non-Released Biology Items

Strand	Content Standard	Student Learning Expectation
MC	3	3
CDL	7	8
EBR	8	1
NS	10	4
MC	2	9
CDL	7	14
EBR	9	1
MC	2	5
CDL	7	17
EBR	8	2
NS	11	6
MC	2	10
HE	4	4
CDL	7	20
EBR	8	6
MC	1	2
HE	5	2
EBR	8	2
MC	3	5
CDL	7	3
EBR	8	8
NS	11	4
HE	4	5
MC	2	6
HE	6	3
CDL	7	10
EBR	9	3
NS	11	3
MC	2	1
HE	4	6
NS	10	2
HE	4	4
NS	12	1
HE	6	7
CDL	7	5
EBR	8	3
NS	13	1
MC	2	8
HE	4	3
CDL	7	18
EBR	8	4
NS	10	2
HE	6	2
CDL	7	14
NS	12	5
HE	5	3
MC	2	5
NS	14	3

ACTAAP

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