



Arkansas Comprehensive Testing, Assessment, and Accountability Program

TEACHER HANDBOOK

BIOLOGY

END-OF-COURSE EXAMINATIONS

2010–2011 ADMINISTRATIONS

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Arkansas Department of Education

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INTRODUCTION

The **Arkansas Comprehensive Testing, Assessment, and Accountability Program (ACTAAP)** includes Mid-Year and Spring Biology End-of-Course Examinations for students completing Biology for high school graduation credit. The examinations consist of multiple-choice and open-response questions that directly assess student knowledge. The *Arkansas Biology Science Curriculum Framework* is the basis for the development of the Biology End-of-Course Examinations.

In January or April 2011, all students who had completed or were completing the required course work for Biology for high school graduation credit participated in the Mid-Year or Spring Biology End-of-Course Examination. Results of the Biology End-of-Course Examinations will be provided to all students, schools, and districts to be used as the basis for instructional change.

The handbook provides information regarding the scoring of student responses to the Biology open-response items. It describes the scoring procedures and the scoring criteria (rubrics) used to assess student responses. Copies of actual student responses are provided, along with scores given to those responses, to illustrate how the scoring criteria were applied to Biology open-response items.

Additional information about the Biology End-of-Course Examination is available through the Arkansas Department of Education. Questions can be addressed to the Assessment Office at 501-682-4558.

SCORING STUDENT RESPONSES TO OPEN-RESPONSE ITEMS

The multiple-choice and open-response test items for the Biology End-of-Course Examination are developed with the assistance and approval of the Biology Content Advisory Committee. This committee is composed of active Arkansas educators with expertise in Science education. The Biology Content Advisory Committee develops and reviews multiple-choice and open-response items to ensure that they reflect the *Arkansas Biology Science Curriculum Framework*.

While multiple-choice items are scored by machine to determine if the student chose the correct answer from four options, open-response items must be scored by trained “readers” using a pre-established set of scoring criteria.

READER TRAINING

Readers are trained to score only one content area. Qualified readers for the Arkansas scoring will be those with a four-year college degree in education, science, or related fields.

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 pre-scored 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 pre-scored papers, and, in order to qualify, each reader must score in exact agreement on at least 80% of the responses and have no more than 5% non-adjacent agreement on 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

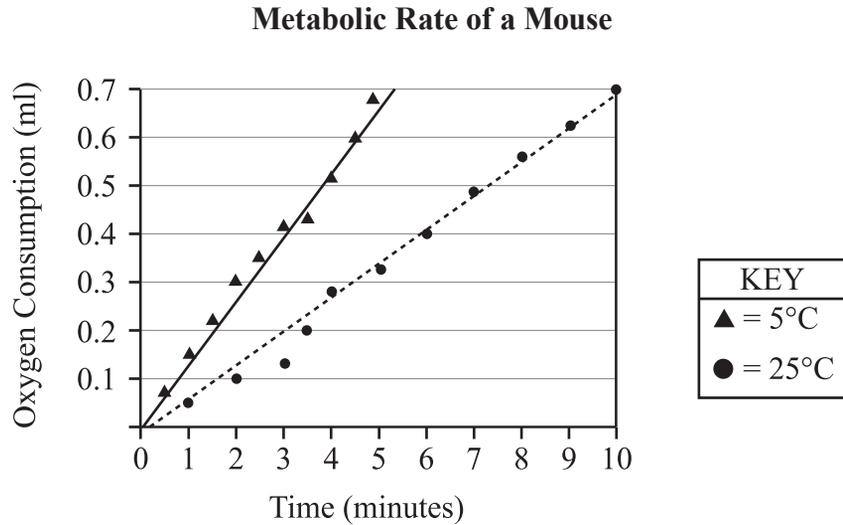
All student responses to the Biology End-of-Course Examination open-response test items are scored independently by two readers. Those two scores are compared, and responses that receive scores that are non-adjacent (a “1” and a “3,” for example) are scored a third time by a Team Leader or the Scoring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

On the following pages, open-response items are presented as they appeared in the *2011 Mid-Year and Spring Biology End-of-Course Examinations*. The specific scoring rubric for each item and annotated responses for each score point of the rubric follows. The goal is for classroom teachers and their students to understand how responses are scored. It is hoped that this understanding will help students see what kind of performance is expected of them on the Biology End-of-Course Examination.

BIOLOGY RESPONSES

ITEM A—2011 BIOLOGY

- A. The graph below shows the metabolic rate of a mouse by measuring its oxygen consumption at two temperatures.



1. Identify the dependent and independent variables in this study.
2. What conclusion can be drawn about the effect of temperature on oxygen consumption?
3. Based on your answer in Part 2, explain why temperature has this effect.

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

ITEM A—2011 BIOLOGY

Item A Scoring Rubric—2011 Biology

Part	Points
1	1 point: identifies an independent variable identifies the dependent variable
2	1 point: explains the effect temperature has on oxygen consumption
3	1 point: explains why temperature has this effect

Score	Description
4	The student earns 4 points. The response shows a <i>complete understanding</i> of independent and dependent variables and homeostasis.
3	The student earns 3 points. The response shows a <i>nearly complete understanding</i> of independent and dependent variables and homeostasis. The response correctly addresses three out of the four tasks.
2	The student earns 2 points. The response shows a <i>limited understanding</i> of independent and dependent variables and homeostasis. The response correctly addresses two out of the four tasks.
1	The student earns 1 point. The response shows a <i>minimum understanding</i> of independent and dependent variables and homeostasis. The response correctly addresses one out of the four tasks.
0	The student earns 0 points. The response shows <i>insufficient understanding</i> of independent and dependent variables and homeostasis. The response, if any, contains major errors or may be entirely irrelevant or incoherent.
B	Blank—No Response. A score of “B” will be reported as “NA.” (No attempt to answer the item. Score of “0” assigned for the item.)

ITEM A SOLUTION AND SCORING—2011 BIOLOGY

SOLUTION AND SCORING

Independent and Dependent Variables

Part 1: Dependent Variable – Oxygen Consumption
Independent Variable – Time **or** Temperature

Part 2: At the lower temperature, oxygen consumption occurs at a faster rate.

or

At the higher temperature, oxygen consumption occurs at a slower rate.

Part 3: More oxygen is consumed because more oxygen is used (cellular respiration) in order for the mouse to maintain its body temperature. (thermoregulation, homeostasis)

ITEM A SAMPLE RESPONSES AND ANNOTATIONS—2011 BIOLOGY

SCORE POINT: 4

<u>Part 1</u>		Points
Correct answer:	“temperature is the independant variable”	1
Correct answer:	“oxygen consumption is the dependant variable”	1
<u>Part 2</u>		
Correct answer:	“Oxygen consumption will rise faster as temperature lowers.”	1
<u>Part 3</u>		
Correct answer:	“...the metabolic rate will have to increase to stabilize core temperature. Therefore the colder the temperature, the higher the metabolic rate and the more oxygen is required.”	1
Total Points		4

1. The temperature is the independant variable in this experiment and the oxygen consumption is the dependant variable.
2. Oxygen consumption will rise as temperature lowers.
↑
faster
3. To keep a core temperature constant, metabolic reactions must take place. Oxygen is required in those reactions and the metabolic rate will have to increase to stabilize core temperature. Therefore the colder the temperature, the higher the metabolic rate and the more oxygen is required.

ITEM A SAMPLE RESPONSES AND ANNOTATIONS—2011 BIOLOGY

SCORE POINT: 3

<u>Part 1</u>		Points
Correct answer:	“dependent variable is the oxygen consumption”	1
Correct answer:	“independent variable is the temperatures”	1
<u>Part 2</u>		
Correct answer:	“the higher the temperature the longer it takes the oxygen consumption to reach 0.7 ml”	1
<u>Part 3</u>		
Incorrect answer:	“the warmer the temperature, the more time it takes to fill the mouse with oxygen”	–
Total Points		3

① The dependent variable is the oxygen consumption of the mouse. The independent variable is the temperatures that the oxygen consumption is measured at.

② The effect of temperature on oxygen consumption is that the the higher the temperature the longer it takes the oxygen consumption to reach 0.7ml.

③ The temperature has the effect to slow down the time for oxygen consumption because the warmer the temperature, the more time it takes to fill the mouse with oxygen.

ITEM A SAMPLE RESPONSES AND ANNOTATIONS—2011 BIOLOGY

SCORE POINT: 2

<u>Part 1</u>		Points
Incorrect answer:	“dependent variable is the temperature”	–
Incorrect answer:	“independent is the oxygen consumption”	–
<u>Part 2</u>		
Correct answer:	“the hotter the temp. the slower the oxygen consumption”	1
<u>Part 3</u>		
Correct answer:	“the body must produce heat for itself so it shakes and shivers in cold environments so it uses more energy and takes in more oxygen and the metabolism rises to break down food faster”	1
Total Points		2

- ① the dependent variable is the temperature, the independent is the oxygen consumption and the metabolic rate.
- ② that the hotter the temp. the slower the oxygen consumption and the colder the temp. the oxygen consumption goes up.
- ③ the body must produce heat for itself so it shakes and shivers in cold environments so it uses more energy and takes in more oxygen and the metabolism rises to break down food faster. When its hotter the body is using less energy and slows down oxygen consumption and metabolism because it don't need as much energy.

ITEM A SAMPLE RESPONSES AND ANNOTATIONS—2011 BIOLOGY

SCORE POINT: 1

<u>Part 1</u>		Points
Correct answer:	“Independent is time.”	1
Incorrect answer:	“Dependant is temperature”	-
<u>Part 2</u>		
Incorrect answer:	“The hotter the temperature, the more oxygen will be consumed.”	-
<u>Part 3</u>		
Incorrect answer:	“...the body sweats and works hard. Oxygen is needed for this so your body must breath more rapidly.”	-
Total Points		1

1 Independent is time.
Dependant is temperature

2 The hotter the temperature, the more oxygen will be consumed.

3 Because the body sweats and works hard.

Oxygen is needed for this so your body must breath more rapidly.

ITEM A SAMPLE RESPONSES AND ANNOTATIONS—2011 BIOLOGY

SCORE POINT: 0

<u>Part 1</u>		Points
Incorrect answer:	“time is the dependent variable”	-
Incorrect answer:	“the independent variable is the oxygen consumption”	-
<u>Part 2</u>		
Incorrect answer:	“the higher the temperature the more oxygen consumed”	-
<u>Part 3</u>		
Incorrect answer:	“cooler temperatures require less oxygen and higher temperatures require more oxygen”	-
Total Points		0

① The time is the dependent variable and the independent variable is the oxygen consumption.

② The relationship between temperature and oxygen consumption is the higher the temperature the more oxygen consumed.

③ Temperature has this effect because cooler temperatures require less oxygen and higher temperatures require more oxygen.

ITEM B—2011 BIOLOGY

B. Bacteria can be beneficial or harmful.

1. Identify two beneficial effects of bacteria.
2. Identify two harmful effects of bacteria.

BE SURE TO LABEL YOUR RESPONSES 1 AND 2.

Item B Scoring Rubric—2011 Biology

Part	Points
1	1 point: identifies one positive outcome of bacterial action 1 point: identifies a second positive outcome of bacterial action
2	1 point: identifies one negative outcome of bacterial action 1 point: identifies a second negative outcome of bacterial action

Score	Description
4	The student earns 4 points. The response shows a <i>complete understanding</i> of the importance of bacteria. The response describes two positive and two negative outcomes of bacterial action.
3	The student earns 3 points. The response shows a <i>nearly complete understanding</i> of the importance of bacteria. The response correctly addresses three out of the four tasks.
2	The student earns 2 points. The response shows a <i>limited understanding</i> of the importance of bacteria. The response correctly addresses two out of the four tasks.
1	The student earns 1 point. The response shows a <i>minimum understanding</i> of the importance of bacteria. The response correctly addresses one out of the four tasks.
0	The student earns 0 points. The response shows <i>insufficient understanding</i> of the importance of bacteria. The response, if any, contains major errors or may be entirely irrelevant or incoherent.
B	Blank—No Response. A score of “B” will be reported as “NA.” (No attempt to answer the item. Score of “0” assigned for the item.)

ITEM B SOLUTION AND SCORING—2011 BIOLOGY

SOLUTION AND SCORING

Beneficial and Harmful Effects of Bacteria

Part	Points	
1	2 points	<p><u>Beneficial Effects</u></p> <p>Food Production: yogurt, sour cream, buttermilk, cheese, wine, sauerkraut, pickles, olives, soy sauce, vinegar</p> <p>Decomposition of organic matter: dead organisms</p> <p>Decomposition of waste: septic tanks, sewage treatment</p> <p>Bioremediation: clean up oil or chemical spills</p> <p>Nitrogen Fixation: convert atmospheric nitrogen to ammonia</p> <p>Transgenic bacteria are used to produce: insulin some antibiotics human growth hormone interferon Hepatitis B vaccine</p> <p>Replacement for chemical pesticides</p> <p>Preventing pathogens: normal flora of the intestines lactic acid bacteria in plant roots</p> <p>Fuel production: decompose garbage and sewage to produce methane nitrogen fixing bacteria are used to produce hydrogen gas</p>
2	2 points	<p><u>Harmful Effects</u></p> <p>Pathogenic: cause disease in humans or animals or plants</p> <p>Spoilage: food or crops</p> <p>Toxins: some bacteria produce toxins that can be deadly</p> <p>Tooth decay</p> <p>Contamination of water</p>

ITEM B SAMPLE RESPONSES AND ANNOTATIONS—2011 BIOLOGY

SCORE POINT: 4

<u>Part 1</u>		Points
Correct answer:	“used in the production of some foods”	1
Correct answer:	“used to protect crops as pesticides” <u>or</u> “produce anti-biotics”	1
<u>Part 2</u>		
Correct answer:	“cause sickness”	1
Correct answer:	“infect crops and kill them”	1
Total Points		4

① Bacteria can be used in the production of some foods, like cheese, milk, yogurt, and other products. They can also be used to protect crops as pesticides, and they're also used to produce anti-biotics for humans.

② Bacteria can enter the human body and cause a bacterial infection, which would cause sickness and possibly require medical treatment. Bacteria can also infect crops and kill them, affecting both economy and the production of food and produce.

ITEM B SAMPLE RESPONSES AND ANNOTATIONS—2011 BIOLOGY

SCORE POINT: 3

<u>Part 1</u>		Points
Correct answer:	“used in medicine, such as E. coli bacteria that are modified to produce insulin”	1
Correct answer:	“...produce vitamins from food in the human large intestine...”	1
<u>Part 2</u>		
Incorrect answer:	“cause disease (influenza...)”	–
Correct answer:	“contribute to spoiling food”	1
Total Points		3

① bacteria are used in medicine, such as E. coli bacteria that are modified to produce insulin for the diabetic. bacteria also produce vitamins from food in the human large intestine, creating a symbiotic relationship.

② some bacteria cause disease (influenza, pneumonia, strep throat) bacteria also contribute to spoiling food, such as milk.

ITEM B SAMPLE RESPONSES AND ANNOTATIONS—2011 BIOLOGY

SCORE POINT: 2

<u>Part 1</u>		Points
Incorrect answer:	“They can help diseases.”	–
Correct answer:	“provide food for microscopic organisms”	1
<u>Part 2</u>		
Incorrect answer:	“cause the red tide”	–
Correct answer:	“make you sick”	1
Total Points		2

1

Bacteria is beneficial in many ways
 Beneficial way #1.
 They can help diseases.
 Beneficial way #2
 Bacteria can provide food for microscopic organisms
 and are the base of the food web.

2

Bacteria can be harmful in many ways.
 Harmful way #1.
 Bacteria can cause the red tide, which is very toxic.
 Harmful way #2
 They can destroy beneficial bacteria and make you
 sick.

ITEM B SAMPLE RESPONSES AND ANNOTATIONS—2011 BIOLOGY

SCORE POINT: 1

<u>Part 1</u>		Points
Correct answer:	“decompose an organism back to earth”	1
Incorrect answer:	“can make something grow”	–
<u>Part 2</u>		
Incorrect answer:	“turns in to fungi”	–
Incorrect answer:	“turns into harmful viruses”	–
Total Points		1

1) two ways bacteria can be beneficial is
 ① it can decompose an organism back to earth
 or ② it can make something grow known
 as growing bacteria.

2) two ways bacteria can be harmful is
 ① bacteria that turns in to fungi (like on
 food) and ② bacteria that turns into
 harmful viruses that are deadly.

ITEM B SAMPLE RESPONSES AND ANNOTATIONS—2011 BIOLOGY

SCORE POINT: 0

<u>Part 1</u>		Points
Incorrect answer:	“can make certain things grow”	–
Incorrect answer:	“can keep away certain species”	–
<u>Part 2</u>		
Incorrect answer:	“can cause a defect in something”	–
Incorrect answer:	“could be harmful to the Body”	–
Total Points		0

1. Bacteria can make certain things grow and it can keep away certain species.

2. Bacteria can cause a defect in something and it could be harmful to the Body.

ITEM C—2011 BIOLOGY

C. The following symbiotic relationships exist within an ecosystem.

- parasitism
- mutualism
- commensalism

1. Define one of these symbiotic relationships.
2. Provide an example of this symbiotic relationship.
3. Define a second type of symbiotic relationship.
4. Provide an example of this symbiotic relationship.

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

Item C Scoring Rubric—2011 Biology

Part	Points
1	2 points: defines two types of symbiotic relationships
2	2 points: provides an example of each relationship

Score	Description
4	The student earns 4 points. The response shows a <i>complete understanding</i> of symbiosis. The response identifies and defines two forms of symbiosis and provides an example of each form.
3	The student earns 3 points. The response shows a <i>nearly complete understanding</i> of symbiosis. The response correctly addresses three out of the four tasks.
2	The student earns 2 points. The response shows a <i>limited understanding</i> of symbiosis. The response correctly addresses two out of the four tasks.
1	The student earns 1 point. The response shows a <i>minimum understanding</i> of symbiosis. The response correctly addresses one out of the four tasks.
0	The student earns 0 points. The response shows <i>insufficient understanding</i> of symbiosis. The response, if any, contains major errors or may be entirely irrelevant or incoherent.
B	Blank—No Response. A score of “B” will be reported as “NA.” (No attempt to answer the item. Score of “0” assigned for the item.)

ITEM C SOLUTION AND SCORING—2011 BIOLOGY

SOLUTION AND SCORING

Symbiotic Relationships

Part	Points	
1 and 3	2 points	<p>Parasitism: the relationship between dissimilar organisms in which one organism benefits while the other organism is harmed</p> <p>Mutualism: the relationship between dissimilar organisms in which both organisms benefit</p> <p>Commensalism: the relationship in which one organism benefits and the other organism is unaffected</p>
2 and 4	2 points	<p>Parasitism Examples: must include parasite and host dog / fleas dog / tick mistletoe / tree tapeworm / cow</p> <p>Common human parasites: Lice Hookworm Giardia Roundworm (Ascaris) Toxoplasma Trichinosis Plasmodium Tapeworm Whipworm Flukes Athlete’s foot</p> <p>Mutualism Examples: ants / aphids clown fish / sea anemone green algae / fungus (lichen) butterflies / flowers cattle egret / cape buffalo E. coli / human gut</p> <p>Commensalism Examples: barnacles / whales cattle egret / cape buffalo sponges / sea stars, shrimp or snails orchid / tree clown fish / sea anemone remora / shark</p> <p>and other correct symbiotic relationships</p>

ITEM C SAMPLE RESPONSES AND ANNOTATIONS—2011 BIOLOGY

SCORE POINT: 4

<u>Part 1</u>		Points
Correct answer:	“commensalism...1 organism is benefitting from the relationship and the other organism isn’t affected by the relationship”	1
<u>Part 2</u>		
Correct answer:	“a tree...orchid flower”	1
<u>Part 3</u>		
Correct answer:	“parasitism...1 organism is benefitting from the relationship and the other organism is being harmed by the relationship”	1
<u>Part 4</u>		
Correct answer:	“tick is living on a dog”	1
Total Points		4

- 1.) Commensalism - where 2 organisms live together in an environment and 1 organism is benefitting from the relationship and the other organism isn't affected by the relationship

- 2.) a tree has an orchid flower living on it so the flower can get water/nutrients from the tree, but the orchid neither harms or helps the tree

- 3.) parasitism - where 2 organisms live together in an environment and 1 organism is benefitting from the relationship and the other organism is being harmed by the relationship

- 4.) a tick is living on a dog. The tick benefits by taking some of the dog's blood for the tick's food while the dog is being harmed because it is losing blood which is essential to life. The tick is being benefitted while the dog is being harmed

ITEM C SAMPLE RESPONSES AND ANNOTATIONS—2011 BIOLOGY

SCORE POINT: 3

<u>Part 1</u>		Points
Correct answer:	“parasitism-one organism benefits from the relationship, while the other is harmed”	1
<u>Part 2</u>		
Correct answer:	“a tapeworm inside a human”	1
<u>Part 3</u>		
Correct answer:	“mutualism-both organisms benefit from the relationship”	1
<u>Part 4</u>		
Incorrect answer:	“a type of monkey eats bugs off a fellow monkey’s back”	–
Total Points		3

- 1) parasitism - one organism benefits from the relationship, while the other is harmed.
- 2) a tapeworm inside a human. The tapeworm receives food, but the human loses it.
- 3) mutualism - both organisms benefit from the relationship.
- 4) a type of monkey eats bugs off of a fellow monkey's back. One monkey receives food, and the other monkey receives cleanliness + possibly the removal of a parasite organism.

ITEM C SAMPLE RESPONSES AND ANNOTATIONS—2011 BIOLOGY

SCORE POINT: 2

<u>Part 1</u>		Points
Incorrect answer:	“parasitism-one organism benefit from a relationship”	–
<u>Part 2</u>		
Correct answer:	“flea sucking the blood from a dog”	1
<u>Part 3</u>		
Correct answer:	“mutualism-both organisms benefit”	1
<u>Part 4</u>		
Incorrect answer:	“fish living in a plant”	–
Total Points		2

- 1) parasitism- one organism benefit from a relationship
- 2) A flea sucking the blood from a dog, because only the flea is benefiting
- 3) mutualism- both organisms benefit from a relationship.
- 4) A fish living in a plant, because the plant protect the fish from other fish by shocking them, and the fish cleans the plant.

ITEM C SAMPLE RESPONSES AND ANNOTATIONS—2011 BIOLOGY

SCORE POINT: 1

<u>Part 1</u>		Points
Incorrect answer:	“mutalism”	–
<u>Part 2</u>		
Correct answer:	“Bee and a flower”	1
<u>Part 3</u>		
Incorrect answer:	“parastion”	–
<u>Part 4</u>		
Incorrect answer:	“Rock in a volcano”	–
Total Points		1

1. mutalism
2. Bee and a flower
3. parastion
4. Rock in a volcano

ITEM C SAMPLE RESPONSES AND ANNOTATIONS—2011 BIOLOGY

SCORE POINT: 0

<u>Part 1</u>		Points
Incorrect answer:	“commensalism; symbiotic is what they have in common whats the same about the two”	–
<u>Part 2</u>		
Incorrect answer:	“starfish”	–
<u>Part 3</u>		
Incorrect answer:	“parasitism; symbiotic something that is paired up that are the same but don't act the same”	–
<u>Part 4</u>		
Incorrect answer:	“starfish and a human body”	–
Total Points		0

- Parasitism
- Mutualism
- Commensalism

1 Commensalism; symbiotic is what they have in common whats the same about the two.

2 Example: on starfish
You can cut them down the middle and you would get the same thing on both sides

3. Parasitism; symbiotic something that is paired up that are the same but don't act the same.

4 Example on starfish and a human body they are two different things but when you cut them down the middle they're symmetrical.

ITEM D—2011 BIOLOGY

- D.** Eukaryotic cells contain both DNA and RNA.
1. Identify one location of DNA in an animal cell.
 2. Describe the function of DNA.
 3. Identify one location of RNA in an animal cell.
 4. Describe the function of RNA.

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

Item D Scoring Rubric—2011 Biology

Part	Points
1	1 point: identifies the location of DNA in an animal cell
2	1 point: describes the function of DNA
3	1 point: identifies the location of RNA in an animal cell
4	1 point: describes the function of RNA

Score	Description
4	The student earns 4 points. The response shows a <i>complete understanding</i> of DNA and RNA. The response identifies the location of DNA and RNA in animal cells and explains the function of each.
3	The student earns 3 points. The response shows a <i>nearly complete understanding</i> of DNA and RNA. The response correctly addresses three out of the four tasks.
2	The student earns 2 points. The response shows a <i>limited understanding</i> of DNA and RNA. The response correctly addresses two out of the four tasks.
1	The student earns 1 point. The response shows a <i>minimum understanding</i> of DNA and RNA. The response correctly addresses one out of the four tasks.
0	The student earns 0 points. The response shows <i>insufficient understanding</i> of DNA and RNA. The response, if any, contains major errors or may be entirely irrelevant or incoherent.
B	Blank—No Response. A score of “B” will be reported as “NA.” (No attempt to answer the item. Score of “0” assigned for the item.)

ITEM D SOLUTION AND SCORING—2011 BIOLOGY

SOLUTION AND SCORING

Location and Function of DNA and RNA in an Animal Cell

Part	Points	
1	1 point	Locations of DNA <ul style="list-style-type: none">• nucleus• mitochondria• chromosome
2	1 point	Functions of DNA <ul style="list-style-type: none">• store genetic information• transcribe RNA
3	1 point	Locations of RNA <ul style="list-style-type: none">• cytoplasm• ribosome• nucleus• nucleolus• rough endoplasmic reticulum
4	1 point	Functions of RNA <ul style="list-style-type: none">• transfer and transport information essential for protein synthesis• carrier of genetic information• catalyst for biochemical reactions (ribozyme)• adaptor molecule for protein synthesis• structural support molecule (ribosome)

ITEM D SAMPLE RESPONSES AND ANNOTATIONS—2011 BIOLOGY

SCORE POINT: 4

<u>Part 1</u>		Points
Correct answer:	“nucleus”	1
<u>Part 2</u>		
Correct answer:	“stores genetic information”	1
<u>Part 3</u>		
Correct answer:	“cytoplasm”	1
<u>Part 4</u>		
Correct answer:	“codes genetic information to make proteins”	1
Total Points		4

- ① DNA is located in the nucleus.
- ② DNA stores genetic information for cells.
DNA has instructions for what the cell's function is.
- ③ RNA can be found in the cytoplasm during protein synthesis.
- ④ RNA codes genetic information to make proteins.
It travels from the nucleus to the cytoplasm to carry out protein synthesis.

ITEM D SAMPLE RESPONSES AND ANNOTATIONS—2011 BIOLOGY

SCORE POINT: 3

<u>Part 1</u>		Points
Correct answer:	“nucleus”	1
<u>Part 2</u>		
Correct answer:	“stores gene information”	1
<u>Part 3</u>		
Correct answer:	“ribosome”	1
<u>Part 4</u>		
Incorrect answer:	“building blocks of protein”	–
Total Points		3

- ① nucleus
- ② stores gene information
- ③ ribosome
- ④ building blocks of protein

ITEM D SAMPLE RESPONSES AND ANNOTATIONS—2011 BIOLOGY

SCORE POINT: 2

<u>Part 1</u>		Points
Incorrect answer:	“double helix DNA Strand”	–
<u>Part 2</u>		
Correct answer:	“stores all the genetic make-up”	1
<u>Part 3</u>		
Incorrect answer:	“a single strand”	–
<u>Part 4</u>		
Correct answer:	“Transports info from the nucleus to ribosomes for protein synthesis”	1
Total Points		2

1 The double helix DNA strand

2 It stores all the genetic make-up of an organism

3 RNA is a single strand

1 Transports info from the nucleus to ribosomes for protein synthesis.

ITEM D SAMPLE RESPONSES AND ANNOTATIONS—2011 BIOLOGY

SCORE POINT: 1

<u>Part 1</u>		Points
Correct answer:	“mitochondria”	1
<u>Part 2</u>		
Incorrect answer:	“tells the identity of something”	–
<u>Part 3</u>		
Incorrect answer:	“cloroplast”	–
<u>Part 4</u>		
Incorrect answer:	“control the amount of hair color, eye color, or skin”	–
Total Points		1

1. (1) One is located in the mitochondria.

2. (2) DNA tells the identity of something, ex. hair color, eye color and skin color.

3. (3) One is located in the cloroplast.

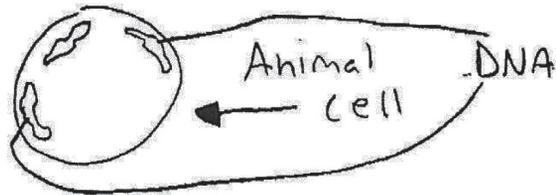
4. (4) RNA control the amount of hair color, eye color, or skin you have or how much shade do you have.

ITEM D SAMPLE RESPONSES AND ANNOTATIONS—2011 BIOLOGY

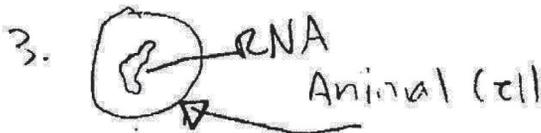
SCORE POINT: 0

<u>Part 1</u>		Points
Incorrect answer:	The location of the DNA is not identified.	-
<u>Part 2</u>		
Incorrect answer:	“to carry out different chromosomes to make up a character”	-
<u>Part 3</u>		
Incorrect answer:	The location of the RNA is not identified.	-
<u>Part 4</u>		
Incorrect answer:	“carries out different functions from the DNA”	-
Total Points		0

1.



2. The function of DNA is to carry out different chromosomes to make up a character.



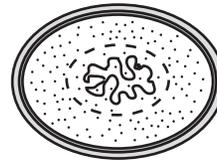
4. The function of RNA is to be a twin of DNA and it carries out different functions from the DNA

ITEM E—2011 BIOLOGY

E. The graphic below shows drawings of what two **different** types of cells may look like.



Eukaryotic Cell



Prokaryotic Cell

1. Describe two structural similarities between a eukaryotic cell and a prokaryotic cell.
2. Other than size or shape, describe two structural differences between a eukaryotic cell and a prokaryotic cell.

In your response, be sure to use appropriate scientific names for cellular structures.

BE SURE TO LABEL YOUR RESPONSES 1 AND 2.

ITEM E—2011 BIOLOGY

Item E Scoring Rubric—2011 Biology

Part	Points
1	2 points: describes two structural similarities between prokaryotic cells and eukaryotic cells
2	2 points: describes two structural differences between prokaryotic cells and eukaryotic cells

Score	Description
4	The student earns 4 points. The response shows a <i>complete understanding</i> of the types of cells. The response explains the structural similarities and differences between the two cell types.
3	The student earns 3 points. The response shows a <i>nearly complete understanding</i> of the types of cells. The response correctly addresses three out of the four tasks.
2	The student earns 2 points. The response shows a <i>limited understanding</i> of the types of cells. The response correctly addresses two out of the four tasks.
1	The student earns 1 point. The response shows a <i>minimum understanding</i> of the types of cells. The response correctly addresses one out of the four tasks.
0	The student earns 0 points. The response shows <i>insufficient understanding</i> of the types of cells. The response, if any, contains major errors or may be entirely irrelevant or incoherent.
B	Blank—No Response. A score of “B” will be reported as “NA.” (No attempt to answer the item. Score of “0” assigned for the item.)

ITEM E SOLUTION AND SCORING—2011 BIOLOGY

SOLUTION AND SCORING

Structural Similarities and Differences of Prokaryotic and Eukaryotic Cells

Part	Points
1	<p>2 points total 1 point each</p> <p><u>Structural Similarities</u> Eukaryotic and prokaryotic cells both have: DNA and/or RNA (genetic material) ribosomes cytoplasm (cytosol) cytoskeleton plasma membrane</p>
2	<p>2 points total 1 point each</p> <p><u>Structural Differences</u> Eukaryotic cells have membrane bound organelles and prokaryotic cells do not. (nucleus, mitochondria, Golgi body, chloroplast, lysosome, endoplasmic reticulum, vacuole)</p> <p>The cell wall composition differs between eukaryotes and prokaryotes. Eubacteria – peptidoglycan Archae – proteins, glycoproteins and polysaccharides Plants – cellulose Fungi – chitin Animals – do not have a cell wall</p> <p>Unlike eukaryotic DNA, there are not histone proteins associated with prokaryotic DNA.</p> <p>Prokaryotic DNA is usually circular while eukaryotic DNA is usually linear.</p> <p>The ribosomes of eukaryotic cells are larger and more complex (contain more types of rRNA and proteins) than prokaryotic ribosomes.</p>

ITEM E SAMPLE RESPONSES AND ANNOTATIONS—2011 BIOLOGY

SCORE POINT: 4

<u>Part 1</u>		Points
Correct answer:	“both have DNA”	1
Correct answer:	“both also have cytoplasm”	1
<u>Part 2</u>		
Correct answer:	“Eukaryotic cells have membrane bound organelles, where prokaryotic cells do not.”	1
Correct answer:	“Eukaryotic cells also have a true nucleus”	1
Total Points		4

1. - Eukaryotic and Prokaryotic cells both have DNA material used to carry out cell functions.
- They both also have cytoplasm within in the cell for structural support and to hold organelles + genetic material.
-
2. - Eukaryotic cells have membrane bound organelles, where prokaryotic cells do not. mitochondria
- Eukaryotic cells also have a true nucleus enclosing DNA. Prokaryotic has no true nucleus.

ITEM E SAMPLE RESPONSES AND ANNOTATIONS—2011 BIOLOGY

SCORE POINT: 3

<u>Part 1</u>		Points
Incorrect answer:	“their possession of cell walls”	–
Correct answer:	“their possession of ...ribosomes”	1
<u>Part 2</u>		
Correct answer:	“presence of a nucleus in eukaryotic cells and the lack of a nucleus in a prokaryotic cell”	1
Correct answer:	“Prokaryotic cells also do not contain mitochondria, whereas eukaryotic cells do.”	1
Total Points		3

- ① Two similarities between prokaryotic and eukaryotic cells are their possession of cell walls and ribosomes. Both cells need cell walls to protect the cell and hold its contents within in cell. They both need ribosomes for proper cell function.
- ② The most obvious and defining difference between prokaryotic cells and eukaryotic cells is the ^① presence of a nucleus in eukaryotic cells and the lack of a nucleus in a prokaryotic cell. Prokaryotic cells also do not contain ^② mitochondria, whereas eukaryotic cells do.

ITEM E SAMPLE RESPONSES AND ANNOTATIONS—2011 BIOLOGY

SCORE POINT: 2

<u>Part 1</u>		Points
Incorrect answer:	“both have nucleuses”	–
Incorrect answer:	“both are rounded”	–
<u>Part 2</u>		
Correct answer:	“Eukaryotic cell has lysosomes and the prokaryotic does not.”	1
Correct answer:	“Eukaryotic cell has golgi bodies and the prokaryotic does not.”	1
Total Points		2

① They both have nucleuses and both are rounded.

② Eukaryotic cell has lysosomes and the prokaryotic does not.
Eukaryotic cell has golgi bodies and the prokaryotic does not.

ITEM E SAMPLE RESPONSES AND ANNOTATIONS—2011 BIOLOGY

SCORE POINT: 1

<u>Part 1</u>		Points
Incorrect answer:	“both round shaped”	-
Correct answer:	“both have a cell membrane”	1
<u>Part 2</u>		
Incorrect answer:	“one has nucleus and the other doesn't”	-
Incorrect answer:	“one has michondrian and the other doesn't”	-
Total Points		1

1.) They are both round shaped, they almost have the same shape, and they both have a cell membrane which is part of the structure.

2.) one has nucleus and the other doesnt, one has michondrian and the other doesnt

ITEM E SAMPLE RESPONSES AND ANNOTATIONS—2011 BIOLOGY

SCORE POINT: 0

<u>Part 1</u>		Points
Incorrect answer:	“are a single-celled organism”	–
Incorrect answer:	“have a nucleus membrane”	–
<u>Part 2</u>		
Incorrect answer:	“Eukaryotes don’t have a nucleus”	–
Incorrect answer:	“eukaryotes lack a membrane-bound organelle”	–
Total Points		0

1. Each are a single-celled organism. Each have a nucleus membrane.

2. Eukaryotes don't have a nucleus and eukaryotes lack a membrane-bound organelle. Prokaryotes have both.

ACTAAP

Arkansas Comprehensive Testing, Assessment, and Accountability Program

DEVELOPED FOR THE ARKANSAS DEPARTMENT OF EDUCATION, LITTLE ROCK, AR 72201

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