



Arkansas Comprehensive Testing, Assessment, and Accountability Program

TEACHER HANDBOOK

BIOLOGY END-OF-COURSE EXAMINATIONS

2011–2012 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 2012, 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 Office of Student Assessment 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 comprised 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 *2012 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—2012 BIOLOGY

- A. According to one evolutionary theory, insect species such as bees increased dramatically after the emergence of flowering plants. This may have led to an increase in the adaptations of the insects and the plants.
1. Describe one reason why the number of insect species may have increased when flowering plants appeared.
 2. Describe another reason why the number of insect species may have increased when flowering plants appeared.
 3. Describe one adaptation that plant species may have developed in response to the increase in insect species.
 4. Describe another adaptation that plant species may have developed in response to the increase in insect species.

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

ITEM A—2012 BIOLOGY

Item A Scoring Rubric—2012 Biology

Part	Points
1	1 point possible: Correctly identifies one reason for the increase in insect species.
2	1 point possible: Correctly identifies another reason for the increase in insect species.
3	1 point possible: Correctly identifies one adaptation plants developed in response to the increase in insect species.
4	1 point possible: Correctly identifies another adaptation plants developed in response to the increase in insect species.

Score	Description
4	The response shows a <i>complete understanding</i> of the concepts of evaluating evolution in terms of evidence as required by the problem. The student responds correctly to all parts of the task.
3	The response shows a <i>nearly complete understanding</i> of the concepts of evaluating evolution in terms of evidence as required by the problem. The student responds correctly to most parts of the task. The response may contain minor errors.
2	The response shows a <i>limited understanding</i> of the concepts of evaluating evolution in terms of evidence as required by the problem. The response may contain a major error.
1	The response shows a <i>minimal understanding</i> of the concepts of evaluating evolution in terms of evidence as required by the problem. The response contains incomplete information and major errors.
0	The response shows <i>insufficient understanding</i> of the concepts evaluating evolution in terms of evidence as required by the problem. The reader may not be able to understand how and why decisions were made. There is no evidence that the student understands the task. The response may be off task or completely irrelevant.
B	Blank – No Response. A score of “B” will be reported as “NA.” (No attempt to answer the item. Score of “0” is assigned for the item.)

ITEM A SOLUTION AND SCORING—2012 BIOLOGY

SOLUTION AND SCORING

Part	Points
1 and 2	1 point possible for each part: a new source of food a new habitat an increase in habitats a new niche protection from predators a place to reproduce and other correct reasons for the increase in insect species
3 and 4	1 point possible for each part: producing less pollen toxins thorns offensive odors pheromones sticky pollen stronger stems brighter petals fragrant odors and other correct plant adaptations

ITEM A SAMPLE RESPONSES AND ANNOTATIONS—2012 BIOLOGY

SCORE POINT: 4

<u>Part 1</u>		Points
Correct description:	"...insects feed on the flowering plants."	1
<u>Part 2</u>		Points
Correct description:	"...could have used flowering plants for shelter from predators."	1
<u>Part 3</u>		Points
Correct description:	"...pollen that catches on the bodies of insects so the insects help the plant reproduce..."	1
<u>Part 4</u>		Points
Correct description:	"...bright colors and sweet smells to encourage insects to pollinate them."	1
Total Points		4

1. One reason why the number of insect species may have increased when flowering plants appeared is that the insects feed on the flowering plants.

2. Another reason why the number of insect species may have increased when flowering plants appeared is that insect species could have used flowering plants for shelter from predators.

3. One adaptation that plant species may have developed in response to the increase in insect species is pollen that catches on the bodies of insects so the insects help the plant reproduce by moving pollen from flower to flower.

4. Another adaptation that plant species might have developed in response to the increase in insect species is bright colors and sweet smells to encourage insects to pollinate them.

ITEM A SAMPLE RESPONSES AND ANNOTATIONS—2012 BIOLOGY

SCORE POINT: 3

<u>Part 1</u>		Points
Correct description:	“...they found a new source of food. Many insects use the inner parts of flowers and the leaves...”	1
<u>Part 2</u>		Points
Incorrect description:	“...they spread seeds around...”	-
<u>Part 3</u>		Points
Correct description:	“Insects will have a hard time feeding on the plants if they develop thorns or chemicals...”	1
<u>Part 4</u>		Points
Correct description:	“...developed a foul-smelling substance... This will deter insects from getting near the plant...”	1
Total Points		3

1. The insect population may have increased when flowering plants appeared because they found a new source of food. Many insects use the inner parts of flowers and the leaves for nutrition.

2. Another reason for the possible increase is the new flowers are ripe for pollination. When bees and other insects pollinate a flower, they spread the seeds around so that more flowers can grow.

3. In response, the plants may have adapted to combat the insects. One way is to create natural defenses. Insects will have a hard time feeding on the plants if they develop thorns or chemicals that, when ingested, make insects die.

4. Plant species may also developed a foul-smelling substance that they constantly emit. This will deter insects from getting near the plant and will keep the plant alive.

ITEM A SAMPLE RESPONSES AND ANNOTATIONS—2012 BIOLOGY

SCORE POINT: 2

<u>Part 1</u>		Points
Incorrect description:	“Due too their were soo many plant that their were not enough insects their for the population grew.”	-
<u>Part 2</u>		Points
Incorrect description:	“Not all the insects could pollenate the plants they reproduced more.”	-
<u>Part 3</u>		Points
Correct description:	“Defenses too keep away pests like thorns or poisons”	1
<u>Part 4</u>		Points
Correct description:	“Certain colors for the insects too tell which plant to go to like its own identity”	1
Total Points		2

① Due too their were soo many plant that their were not enough insects their for the population grew.

② Not all of the insects could pollenate the plants they reproduced more.

③ Defenses too keep away pests like thorns or poisons

④ Certain colors for the insects too tell which plant to go to like its own identity

ITEM A SAMPLE RESPONSES AND ANNOTATIONS—2012 BIOLOGY

SCORE POINT: 1

<u>Part 1</u>		Points
Incorrect description:	"...more species were able to feed off flowering plants."	1
<u>Part 2</u>		Points
Repeated description:	"...so they could feed off flowers."	-
<u>Part 3</u>		Points
Incorrect description:		-
<u>Part 4</u>		Points
Incorrect description:		-
Total Points		1

1. Because more species were able to feed off flowering plants.

2. It also may have happened because they were unable to find food so they slowly developed so they could feed off flowers.

ITEM A SAMPLE RESPONSES AND ANNOTATIONS—2012 BIOLOGY

SCORE POINT: 0

<u>Part 1</u>		Points
Incorrect description:	"... flowers give off glucose and oxygen..."	-
<u>Part 2</u>		Points
Incorrect description:	"...roots of the plants give off water and carbon dioxide..."	-
<u>Part 3</u>		Points
Incorrect adaptation:	"...the amount of stomata (food)..."	-
<u>Part 4</u>		Points
Incorrect adaptation:	"...amount of water from the roots..."	-
Total Points		0

- 1.) One reason why the number of insect species may have increased when flowering plants appeared is because flowers give off glucose and oxygen. So they take in these elements.
- 2.) Another reason why the number of insect species may have increased is because the roots of the plants give off water and carbon dioxide. So they drink from the roots of the flowers.
- 3.) An adaptation that plant species may have developed is the amount of stomata (food)
- 4.) Another adaptation may be amount of water from the roots of the flowers.

ITEM B—2012 BIOLOGY

B. Organisms are often classified based on type of symmetry.

1. Identify one type of symmetry used to classify organisms. Name an organism which has this type of symmetry. Explain how this organism shows this type of symmetry.
2. Identify another type of symmetry used to classify organisms. Name an organism which has this type of symmetry. Explain how this organism shows this type of symmetry.

BE SURE TO LABEL YOUR RESPONSES 1 AND 2.

Item B Scoring Rubric—2012 Biology

Part	Points
1	2 points possible: States a form of symmetry (1/2 pt), correctly names an organism which exhibits that type of symmetry (1/2 pt), correctly describes the symmetry of the organism they chose (1 pt).
2	2 points possible: States another form of symmetry (1/2 pt), correctly names an organism which exhibits that type of symmetry(1/2 pt), correctly describes the symmetry of the organism they chose (1 pt).

Score	Description
4	The response shows a <i>complete understanding</i> of types of symmetry. The student responds correctly to all parts of the task.
3	The response shows a <i>nearly complete understanding</i> of types of symmetry. The student responds correctly to most parts of the task. The response may contain minor errors.
2	The response shows a <i>limited understanding</i> of types of symmetry. The response may contain a major error.
1	The response shows a <i>minimal understanding</i> of types of symmetry. The response contains incomplete information and major errors.
0	The response shows <i>insufficient understanding</i> of types of symmetry. There is no evidence that the student understands the task. The response may be off task or completely irrelevant.
B	Blank – No Response. A score of “B” will be reported as “NA.” (No attempt to answer the item. Score of “0” is assigned for the item.)

ITEM B SOLUTION AND SCORING—2012 BIOLOGY

SOLUTION AND SCORING

Part	Points
1 and 2	<p>2 points possible for each part:</p> <p>Radial symmetry: Organism has many lines of symmetry that pass through the central axis. OR Body parts are arranged regularly around a central axis.</p> <p>Plants – flowers have roughly identical petals, sepals and stamens around the center of the flower Sea urchins and sea stars – have parts arranged about the axis of mouth in equal sectors Jellyfish – have four canals and thus can be divided into four equal parts</p> <p>Bilateral symmetry: Organism has one line of symmetry that extends from the anterior end to the posterior end running through the midline of the body. The left and right side are mirror images.</p> <p>Humans – are divided by a single plane (sagittal) into two halves which are mirror images Orchids & peas – flowers can be divided into two mirror image halves Octopus, squid, dog, cat, worm, mice, squirrel, fish</p> <p>Asymmetrical symmetry: – have no symmetry Sponges</p> <p>Spherical symmetry: Organism has many lines of symmetry that pass through the center point and divides the organism into two identical halves. Radiolarians, Volvox</p> <p>Biradial symmetry: similar parts are located to either side of the central axis and each of the four sides are identical to the opposite side but different from the adjacent side.</p> <p>Biradial is a combination of radial and bilateral symmetry. Ctenophores exhibit biradial symmetry</p> <p>Pentaradial symmetry: 5 equal parts radiating from a center axis.</p> <p>Various flowering plants exhibit this, as well as radiolarians. Also sea stars, sea urchins (as adults).</p>

ITEM B SAMPLE RESPONSES AND ANNOTATIONS—2012 BIOLOGY

SCORE POINT: 4

<u>Part 1</u>		Points
Correct symmetry:	"...radial..."	1/2
Correct organism:	"...anemone..."	1/2
Correct explanation:	"...the tentacle is duplicated around a central point in the organism..." OR "An infinite number of planes may be drawn through the central point, all with both sides divided by the plane being symmetrical."	1

<u>Part 2</u>		Points
Correct symmetry:	"...bilateral..."	1/2
Correct organism:	"...lobster..."	1/2
Correct explanation:	"...only one plane, or line of symmetry may be drawn down the lobster with both sides of the organism being symmetrical...a right side and a left side may be identified..."	1
Total Points		4

Response 1: One type of symmetry used to classify organisms is radial symmetry. An organism which has this type of symmetry is an anemone. This organism shows radial symmetry because a structure, in this case the tentacle, is duplicated around a central point in the organism. In this case, the mouth of the anemone. An infinite number of planes may be drawn through its central point, all with both sides divided by the plane being symmetrical.

Response 2: Another type of symmetry used to classify organisms is bilateral symmetry. An organism with this type of symmetry is the lobster. This organism shows this type of symmetry because only one plane, or line of symmetry, may be drawn down the lobster with both sides of the organism being symmetrical. Because of this, a right side and left side may be identified; therefore a right and left claw can be identified. The front and rear of the organism may also be identified, with the head being at the anterior end and the tail being at the posterior end.

ITEM B SAMPLE RESPONSES AND ANNOTATIONS—2012 BIOLOGY

SCORE POINT: 3

<u>Part 1</u>		Points
Correct symmetry:	"...asymmetrical..."	1/2
Correct organism:	"...sea sponge..."	1/2
Correct explanation:	"...it cannot be divided evenly no matter how you place the line of symmetry..."	1

<u>Part 2</u>		Points
Correct symmetry:	"...bilateral..."	1/2
Correct organism:	"...humans..."	1/2
Incorrect explanation:	"...where an organism is completely symmetrical on both sides..."	-
Total Points		3

1. One type of Symmetry is asymmetrical symmetry. A sea sponge is asymmetrical because it cannot be divided evenly no matter how you place the line of Symmetry,

2. Another type of Symmetry is bilateral Symmetry, where an organism is completely symmetrical on both sides. An organism that displays this type of symmetry is humans, as they can be divided evenly in half.

ITEM B SAMPLE RESPONSES AND ANNOTATIONS—2012 BIOLOGY

SCORE POINT: 2

<u>Part 1</u>		Points
Correct symmetry:	"...bilateral..."	1/2
Correct organism:	"...butterflies..."	1/2
Incorrect explanation:	"...if you split the butterfly in half only once it would look the same on both sides..."	-

<u>Part 2</u>		Points
Correct symmetry:	"...radial..."	1/2
Correct organism:	"...starfish..."	1/2
Incorrect explanation:	"...you can split the starfish in more than one part...can be split in 5 different pieces"	-
Total Points		2

① bilateral symmetry

butterflies are bilateral organisms

butterflies show this type of symmetry because if you split the butterfly in half only once it would look the same on both sides its able to be seen the same looking just alike

② radial symmetry

starfish are radial organisms

starfish show this type of symmetry because because you can split the starfish in more then one part and it still looks the same starfish can be split in 5 different pieces

ITEM B SAMPLE RESPONSES AND ANNOTATIONS—2012 BIOLOGY

SCORE POINT: 1

<u>Part 1</u>		Points
Incorrect symmetry:		-
Incorrect organism:	"...butterfly..."	-
Incorrect explanation:	"...can be split two ways..."	-

<u>Part 2</u>		Points
Correct symmetry:	"...radial..."	1/2
Incorrect organism:	"...starfish..."	1/2
Incorrect explanation:	"...can only be folded one way..."	-
Total Points		1

1.  It is a butterfly & it can be split two ways.

2.  can only be folded one way
Starfish

• radial symmetry

ITEM B SAMPLE RESPONSES AND ANNOTATIONS—2012 BIOLOGY

SCORE POINT: 0

<u>Part 1</u>		Points
Incorrect symmetry:	"...whether or not they have fur..."	-
Incorrect organism:	"...deer..."	-
Incorrect explanation:	"Having fur puts deer into the mammal category."	-

<u>Part 2</u>		Points
Correct symmetry:	"...whether or not they have wings..."	-
Incorrect organism:	"...bird..."	-
Incorrect explanation:	"Having wings puts the birds in the category along with bats..."	-
Total Points		0

1) One type of symmetry used to classify organisms is whether or not they have fur. An organism with this type of symmetry is a deer. This organism shows this type of symmetry because it has fur while other animals like fish don't. Having fur puts deer into the mammal category.

2) Another type of symmetry is whether or not they have wings. An organism with this type of symmetry is a bird. This organism shows this type of symmetry because it has wings while other animals like dogs don't. Having wings puts the bird in the category along with bats and other winged animals.

ITEM C—2012 BIOLOGY

C. Meiosis is the specialized type of cell division that takes place to form gametes.

1. What are the haploid and diploid numbers of chromosomes in a human cell?
2. Explain why it is important for gametes to have a haploid number of chromosomes.
3. Give an example of a disorder that can occur in development if a gamete does not have the proper number of chromosomes. How does this occur?

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

Item C Scoring Rubric—2012 Biology

Part	Points
1	1 point possible: Correctly identifies the number of chromosomes in human haploid and diploid cells.
2	1 point possible: Correctly describes why it is important for gametes to have a haploid number of chromosomes.
3	2 points possible: Names a disorder that can occur if the number of chromosomes is not correct AND explains how this occurs.

Score	Description
4	The response shows a <i>complete understanding</i> of the concepts of meiosis required by the problem. The student responds correctly to all parts of the task.
3	The response shows a <i>nearly complete understanding</i> of the concepts of meiosis required by the problem. The student responds correctly to most parts of the task. The response may contain minor errors.
2	The response shows a <i>limited understanding</i> of the concepts of meiosis required by the problem. The response may contain a major error.
1	The response shows a <i>minimal understanding</i> of the concepts of meiosis required by the problem. The response contains incomplete information and major errors.
0	The response shows <i>insufficient understanding</i> of the concepts of meiosis required by the problem. There is no evidence that the student understands the task. The response may be off task or completely irrelevant.
B	Blank – No Response. A score of “B” will be reported as “NA.” (No attempt to answer the item. Score of “0” is assigned for the item.)

ITEM C SOLUTION AND SCORING—2012 BIOLOGY

SOLUTION AND SCORING

Part	Points
1	1 point possible: Haploid – 23 chromosomes Diploid – 46 chromosomes
2	1 point possible: Gametes must have a haploid number of chromosomes so when they fuse in fertilization the resulting zygote will have the correct number of chromosome pairs.
3	2 points possible: 1 Point for identification: <ul style="list-style-type: none">• Down syndrome (Trisomy 21)• Turner’s syndrome (Monosomy X)• Klinefelter syndrome (XXY)• Edward’s syndrome (Trisomy 18)• 47 (XYY)• Trisomy X (XXX)• Patau syndrome (Trisomy 13) AND 1 Point for explanation: <ul style="list-style-type: none">• Nondisjunction occurs in meiosis, resulting in gametes that have an extra chromosome. (Down syndrome, Klinefelter syndrome, Edward’s syndrome, Trisomy X, 47) OR Nondisjunction occurs in meiosis, resulting in gametes that have fewer chromosomes. (Turner’s syndrome)

ITEM C SAMPLE RESPONSES AND ANNOTATIONS—2012 BIOLOGY

SCORE POINT: 4

<u>Part 1</u>		Points
Correct response:	“The haploid number is 23. and the diploid number would be 46”	1
<u>Part 2</u>		Points
Correct response:	“It’s important for the gamete to have haploid number of chromosomes because to receive half of the number of chromosomes from each parent.”	1
<u>Part 3</u>		Points
Correct identification:	“XXX syndrome”	1
Correct explanation:	“This occurs because of a nondisjunction during meiosis.”	1
Total Points		4

1.) The haploid number is 23.
and the diploid number would be 46.

2.) It's important for the gamete to have haploid number of chromosomes because to receive half of the number of chromosomes from each parent.

3.) An example would be XXX syndrome. This occurs because of nondisjunction during Meiosis.

ITEM C SAMPLE RESPONSES AND ANNOTATIONS—2012 BIOLOGY

SCORE POINT: 3

<u>Part 1</u>		Points
Correct response:	“The human cell has 46 chromosomes so the haploid would be 23 chromosomes.”	1
<u>Part 2</u>		Points
Correct response:	“...because they’re receiving chromosomes from each parent. So one parent gives 23 and the other gives 23 and you have 46 chromosomes.”	1
<u>Part 3</u>		Points
Correct identification:	“down syndrome (trisomy 21)”	1
Incorrect explanation:	“If the gametes don’t get the right number of chromosomes... You can get all kinds of mutations if you have a chromosome disorder.”	0
Total Points		3

1. The human cell has 46 chromosomes so the haploid would be 23 chromosomes.
2. It's important for gametes to have a haploid because they're receiving chromosomes from each parent. So one parent gives 23 and the other gives 23 and you have 46 chromosomes.
3. If the gametes don't have the right number of chromosomes you can get down syndrome (trisomy 21). You can get all kinds of mutations if you have a chromosome disorder.

ITEM C SAMPLE RESPONSES AND ANNOTATIONS—2012 BIOLOGY

SCORE POINT: 2

<u>Part 1</u>		Points
Correct response:	“46 = human diploid 23 = human haploid.”	1
<u>Part 2</u>		Points
Incorrect response:	“...Because the haploid number of chromosomes is half of the Diploid number of chromosomes.”	0
<u>Part 3</u>		Points
Correct identification:	“Down syndrome”	1
Incorrect explanation:	“...too many chromosomes were produced.”	0
Total Points		2

1. $2n = \text{diploid}$ $\frac{23}{46}$
 $n = \text{haploid}$
 46 = human diploid
 23 = human haploid

2. It is important because the haploid number of chromosomes is half of the diploid number of chromosomes.

3. Down syndrome if it has a trisomy of "21" chromosome. too many chromosomes were produced.

ITEM C SAMPLE RESPONSES AND ANNOTATIONS—2012 BIOLOGY

SCORE POINT: 1

<u>Part 1</u>		Points
Incorrect response:	“The haploid and diploid number of chromosomes in a human cell are 23.”	0
<u>Part 2</u>		Points
Incorrect response:	“...because different birth defects and disorders may occur.”	0
<u>Part 3</u>		Points
Correct identification:	“turner syndromes ...down syndrome”	1
Incorrect explanation:	“...occurs when there is an extra chromosome...occurs when a chromosome is missing.”	0
Total Points		1

① The haploid & diploid number of chromosomes in a human cell are 23

② It is important for gametes to have a haploid # of chromosomes because different birth defects & disorders may occur.

③ An example would be turners syndrome which occurs when there is an extra chromosome.
Another is down syndrome which occurs when a chromosome is missing.

ITEM C SAMPLE RESPONSES AND ANNOTATIONS—2012 BIOLOGY

SCORE POINT: 0

<u>Part 1</u>		Points
Incorrect response:	“46 - haploid 23 - diploid”	0
<u>Part 2</u>		Points
Incorrect response:	“so that there is an equal number of needed chromosomes.”	0
<u>Part 3</u>		Points
Incorrect identification:	“a birth defect, or a mutation.”	0
Incorrect explanation:	“...by not having the correct # of chromosomes.”	0
Total Points		0

1.) 46 - haploid
23 - diploid

2.) so that there is an equal amount of needed chromosomes.

3.) a birth defect, or a ~~an~~ mutation,
by not having the correct # of chromosomes

ITEM D—2012 BIOLOGY

- D.** 1. Identify and describe one process that moves carbon through the carbon cycle.
2. Identify and describe another process that moves carbon through the carbon cycle.

BE SURE TO LABEL YOUR RESPONSES 1 AND 2.

Item D Scoring Rubric—2012 Biology

Part	Points
1	2 points possible: Identifies and describes a process that moves carbon through its cycle, 1 point for each.
2	2 points possible: Identifies and describes a process that moves carbon through its cycle, 1 point for each.

Score	Description
4	The response shows a <i>complete understanding</i> of processes that move carbon through the carbon cycle. The student responds correctly to all parts of the task.
3	The response shows a <i>nearly complete understanding</i> of processes that move carbon through the carbon cycle. The student responds correctly to most parts of the task. The response may contain minor errors.
2	The response shows a <i>limited understanding</i> of processes that move carbon through the carbon cycle. The response may contain a major error.
1	The response shows a <i>minimal understanding</i> of processes that move carbon through the carbon cycle. The response contains incomplete information and major errors.
0	The response shows <i>insufficient understanding</i> of processes that move carbon through the carbon cycle. There is no evidence that the student understands the task. The response may be off task or completely irrelevant.
B	Blank – No Response. A score of “B” will be reported as “NA.” (No attempt to answer the item. Score of “0” is assigned for the item.)

ITEM D SOLUTION AND SCORING—2012 BIOLOGY

SOLUTION AND SCORING

Part	Points
1	<p>2 points possible (1 point each):</p> <p>Identification Combustion Photosynthesis Cellular Respiration Diffusion Decomposition Fossil Fuel and Limestone Formation Consumption of Organic Materials Volcanic Eruption</p>
2	<p>2 points possible (1 point each):</p> <p>Explanation Combustion – Fossil fuels are burned and CO₂ is released Photosynthesis – Plants remove CO₂ from the atmosphere and it is converted to glucose Cellular Respiration – Glucose is converted and CO₂ is returned to the atmosphere Diffusion – CO₂ is dissolved in the oceans Decomposition – CO₂ or CH₄ is produced and released as dead animals or animal waste is broken down Fossil Fuel and Limestone Formation – Conversion of organic materials as the result of pressure Consumption of Organic Materials – Primary consumers eat plants, secondary consumers eat primary consumers etc. Volcanic Eruption – CO₂ and CO are released into the atmosphere</p>

ITEM D SAMPLE RESPONSES AND ANNOTATIONS—2012 BIOLOGY

SCORE POINT: 4

Part 1		Points
Correct identification:	“Photosynthesis ...”	1
Correct description:	“...it starts out with carbon dioxide and water and ends up with glucose and oxygen.”	1
Part 2		Points
Correct identification:	“Cellular respiration...”	1
Correct description:	“...it takes the products of photosynthesis and converts it back into carbon dioxide and water.”	1
Total Points		4

1. Photosynthesis moves carbon through the carbon cycle because it starts out with carbon dioxide and water and ends up with glucose and oxygen.

2. Cellular respiration is another process that moves carbon through the carbon cycle because it takes the products of photosynthesis and converts it back into carbon dioxide and water.

ITEM D SAMPLE RESPONSES AND ANNOTATIONS—2012 BIOLOGY

SCORE POINT: 3

<u>Part 1</u>		Points
Correct identification:	"...process of decomposition."	1
Correct description:	"When living organisms die decomposers such as fungi break down the organism and return the carbon to the soil."	1

<u>Part 2</u>		Points
Correct identification:	"Photosynthesis ..."	1
Incorrect description:	"...the plant takes in the carbon dioxide and produces oxygen..."	0
Total Points		3

1. Decomposers move carbon through the carbon cycle through the process of decomposition. When living organisms die decomposers such as fungi break down the organism and return the carbon to the soil.
2. Photosynthesis moves carbon through the carbon cycle because the plant takes in the carbon dioxide and produces oxygen which humans take in to breath and put off more carbon dioxide for the plant.

ITEM D SAMPLE RESPONSES AND ANNOTATIONS—2012 BIOLOGY

SCORE POINT: 2

<u>Part 1</u>		Points
Correct identification:	“One process...is photosynthesis.”	1
Incorrect description:	“Photosynthesis <u>absorbs</u> energy during the carbon cycle.”	0

<u>Part 2</u>		Points
Correct identification:	“Another process...is cellular respiration.”	1
Incorrect description:	“...cellular respiration releases energy during the carbon cycle.”	0
Total Points		2

R1. one process that moves through the carbon cycle is photosynthesis. photosynthesis absorbs energy during the carbon cycle.

R2. Another process that moves through the carbon cycle is cellular respiration which cellular respiration releases energy during the carbon cycle.

ITEM D SAMPLE RESPONSES AND ANNOTATIONS—2012 BIOLOGY

SCORE POINT: 1

Part 1		Points
Correct identification:	"...decomposition."	1
Incorrect description:	-No description provided-	0

Part 2		Points
Incorrect identification:	"Another process...is people breathing"	0
Incorrect description:	"...which releases carbon dioxide."	0
Total Points		1

1. One process that moves carbon through the carbon cycle is decomposition.

2. Another process that moves carbon through the carbon cycle is people breathing which releases carbon dioxide.

ITEM D SAMPLE RESPONSES AND ANNOTATIONS—2012 BIOLOGY

SCORE POINT: 0

<u>Part 1</u>		Points
Incorrect identification:	"air move the carbon through the carbon cycle"	0
Incorrect description:	"...when the wind blow it blows everything..."	0

<u>Part 2</u>		Points
Incorrect identification:	"Water is another thing ..."	0
Incorrect description:	"...the carbon lays on top of the water, then when the water moves so does the carbon."	0
Total Points		0

(1) air move the carbon through the carbon cycle. Because when the wind blow it blows everything. So the air has way the carbon get through the carbon cycle.

(2) water is a another thing that move carbon around. It moves it because the carbon lays on top of the water, then when the water moves, so does the carbon. That is another way carbon is move through the carbon cycle.

ITEM E—2012 BIOLOGY

- E.** Investigators conduct an experiment to see which type of exercise is most effective for weight loss. Investigators compare running and swimming for 100 participants in the study.
1. Identify and describe three factors that should be held constant in this experiment.
 2. What effect would it have on the results of this investigation if these factors were not held constant? Explain your answer.

BE SURE TO LABEL YOUR RESPONSES 1 AND 2.

ITEM E—2012 BIOLOGY

Item E Scoring Rubric—2012 Biology

Part	Points
1	3 points possible: (½ point Identification + ½ point Description for each factor) Identification and description of three factors that should be held constant.
2	1 point possible: Description of what might happen if the factors were not held constant.

Score	Description
4	The response shows a <i>complete understanding</i> of factors that should be held constant in the experiment. The student responds correctly to all parts of the task.
3	The response shows a <i>nearly complete understanding</i> of factors that should be held constant in the experiment. The student responds correctly to most parts of the task. The response may contain minor errors.
2	The response shows a <i>limited understanding</i> of factors that should be held constant in the experiment. The response may contain a major error.
1	The response shows a <i>minimum understanding</i> of factors that should be held constant in the experiment. The response contains incomplete information and major errors.
0	The response shows <i>insufficient understanding</i> of factors that should be held constant in the experiment. There is no evidence that the student understands the task. The response may be off task or completely irrelevant.
B	Blank – No Response. A score of “B” will be reported as “NA.” (No attempt to answer the item. Score of “0” is assigned for the item.)

ITEM E SOLUTION AND SCORING—2012 BIOLOGY

SOLUTION AND SCORING

Part	Points
1	3 points possible (1 point each): have the same general health be all one gender or evenly split between male and female remain the same throughout the experiment have the same diet be the same age or the ages of each group should be similar be measured with the same scale be measured the same number of times be measured the same time of day exercise for the same amount of time or distance exercise at the same intensity exercise the same number of times per week exercise under the same conditions
2	1 point possible: The results of the investigation would not be valid. There would be no way to determine if either exercise or another variable was responsible for the weight loss.

ITEM E SAMPLE RESPONSES AND ANNOTATIONS—2012 BIOLOGY

SCORE POINT: 4

<u>Part 1</u>		Points
Correct response:	“Age of Participants”	1
Correct response:	“Temperatures for both swimming & running environment”	1
Correct response:	“Amount of time participants exercise” OR “Intensity of workout”	1

<u>Part 2</u>		Points
Correct response:	“...the experiment would be invalid. Say if the runners were working out longer & more intensely than the swimmers.....you would have no way of knowing if it was due to the running or the extra work that they had put it over the swimmers.”	1
Total Points		4

①

- A. Age of Participants
- B. Temperatures for both swimming & running environment
- C. Amount of time participants exercise.
- D. Intensity of workout

② Well, if any of the factors from question one were not held constant, the experiment would be invalid. Say that the runners were working out longer & more intensely than the swimmers, then if they lost more weight you would have no way of knowing if it was due to the running or the extra work that they had put it over the swimmers.

ITEM E SAMPLE RESPONSES AND ANNOTATIONS—2012 BIOLOGY

SCORE POINT: 3

<u>Part 1</u>		Points
Correct response:	“Weight each participant over Monday at 9:00 AM”	1
Correct response:	“Every Participant eat same food amount throughout the experiment”	1
Correct response:	“Each participant must exercise an hour a day”	1

<u>Part 2</u>		Points
Incorrect response:	“You will not be able to tell if either type of exercises was responsible for weight loss. The results have no meaning. You will not be able to draw a conclusion that was realible.”	0
Total Points		3

<p>1 Weight each participants before the experiment begins</p> <p>Weight each participant over Monday at 9:00am</p> <p>Every Participant eat same food amount though out the experimant</p> <p>Each participant must exercise an hour a day</p> <p>Each activite group should have Participant in equal weight group</p>	<p>2 You will not be able to tell either type of exerices was reponsible weight loss.</p> <p>The results have no meaning</p> <p>You will not be able to draw a conclusion that was realible</p>
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ITEM E SAMPLE RESPONSES AND ANNOTATIONS—2012 BIOLOGY

SCORE POINT: 2

Part 1		Points
Correct response:	“Distance of running, distance of swimming”	1
Correct response:	“...environment of running & swimming”	1
Incorrect response:		0

Part 2		Points
Incorrect response:	“The results would be biased because some participants might perform better do to different conditions than others.”	0
Total Points		2

1. Distance of running, distance of swimming, & environment of running & swimming should be held constant.
2. The results would be biased because some participants might perform better do to different conditions than others.

ITEM E SAMPLE RESPONSES AND ANNOTATIONS—2012 BIOLOGY

SCORE POINT: 1

<u>Part 1</u>		Points
Correct response:	“The participants should remain the same (materials)”	1
Incorrect response:	“A <u>hypothesis</u> should be conducted”	0
Incorrect response:	“- And a referal back to the <u>hypothesis</u> after the experiment must be done.”	0

<u>Part 2</u>		Points
Incorrect response:	“-things would get confusing and info could be <u>messed up and unorganized</u> -It wouldn't be an experiment without a <u>hypothesis...</u> ”	0
Total Points		1

① Three factors that should be held constant in this experiment are:

1- The participants should remain the same (materials)

2- A hypothesis should be conducted

3- And a referal back to the hypothesis after the experiment must be done.

② If the factors were not held through the experiment then:

1- things would get confusing and info could be messed up and unorganised

2- It wouldnt be an experiment without a hypothesis

3- And you have to see if what you thought before going into the experiment was even close to what actually happened.

ITEM E SAMPLE RESPONSES AND ANNOTATIONS—2012 BIOLOGY

SCORE POINT: 0

Part 1		Points
Incorrect response:	“speed”	0
Incorrect response:	“distance”	0
Incorrect response:	“time”	0

Part 2		Points
Incorrect response:	“could change your results. Your distance is important because its how far they are running or swimming.”	0
Total Points		0

① speed
distance
time

② could change your results.

your distance is important because its how far they are running or swimming.

ACTAAP

Arkansas Comprehensive Testing, Assessment, and Accountability Program

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

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