ACTAAP

Arkansas Comprehensive Testing, Assessment, and Accountability Program

Teacher Handbook

Biology
End-of-Course Examinations

2013–2014 Administrations

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 development of the Biology End-of-Course Examinations was based on the *Arkansas Biology Science Curriculum Framework*.

In January or April 2014, 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.

This 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 comprises 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, responses to 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 science, education, 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 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 pre-scored 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.

On the following pages, open-response items are presented as they appeared in the *2014 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—2014 BIOLOGY

A. In pea plants, seed shape is controlled by a single gene with two alleles. The allele for round seeds (R) is dominant to the allele for wrinkled seeds (r).

1. Predict the genotypic offspring ratios (or percentages) of a cross between two heterozygous plants.

2. Predict the phenotypic offspring ratios (or percentages) of a cross between two heterozygous plants.

3. A cross between a plant that produces round seeds and a plant that produces wrinkled seeds results in 303 round offspring and 296 wrinkled offspring. List the genotypes of both parents.

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

Item A Scoring Rubric—2014 Biology

Part	Points
1	1 point possible: 1 point for the correct genotypic ratio
2	1 point possible: 1 point for the correct phenotypic ratio
3	2 points possible: Lists the genotypes of both parents

Score	Description
4	Response shows a *complete understanding* of using the laws of probability and Punnett squares to predict genotypic and phenotypic ratios. The student answers correctly and responds to all parts of the task.
3	Response shows a *nearly complete understanding* of using the laws of probability and Punnett squares to predict genotypic and phenotypic ratios. The student presents nearly all answers correctly and responds to all parts of the task. The response may contain minor errors.
2	Response shows a *limited understanding* of using the laws of probability and Punnett squares to predict genotypic and phenotypic ratios. The student answers some questions correctly and responds correctly to most parts of the task. The response may contain a major error.
1	Response shows a *minimal understanding* of using the laws of probability and Punnett squares to predict genotypic and phenotypic ratios. The student presents some correct work that contributes to a correct answer. The response contains incomplete answers and major errors.
0	Response shows *insufficient understanding* of using the laws of probability and Punnett squares to predict genotypic and phenotypic ratios. The reader may not be able to understand how and why decisions were made.
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.)

SOLUTION AND SCORING

4 points possible:

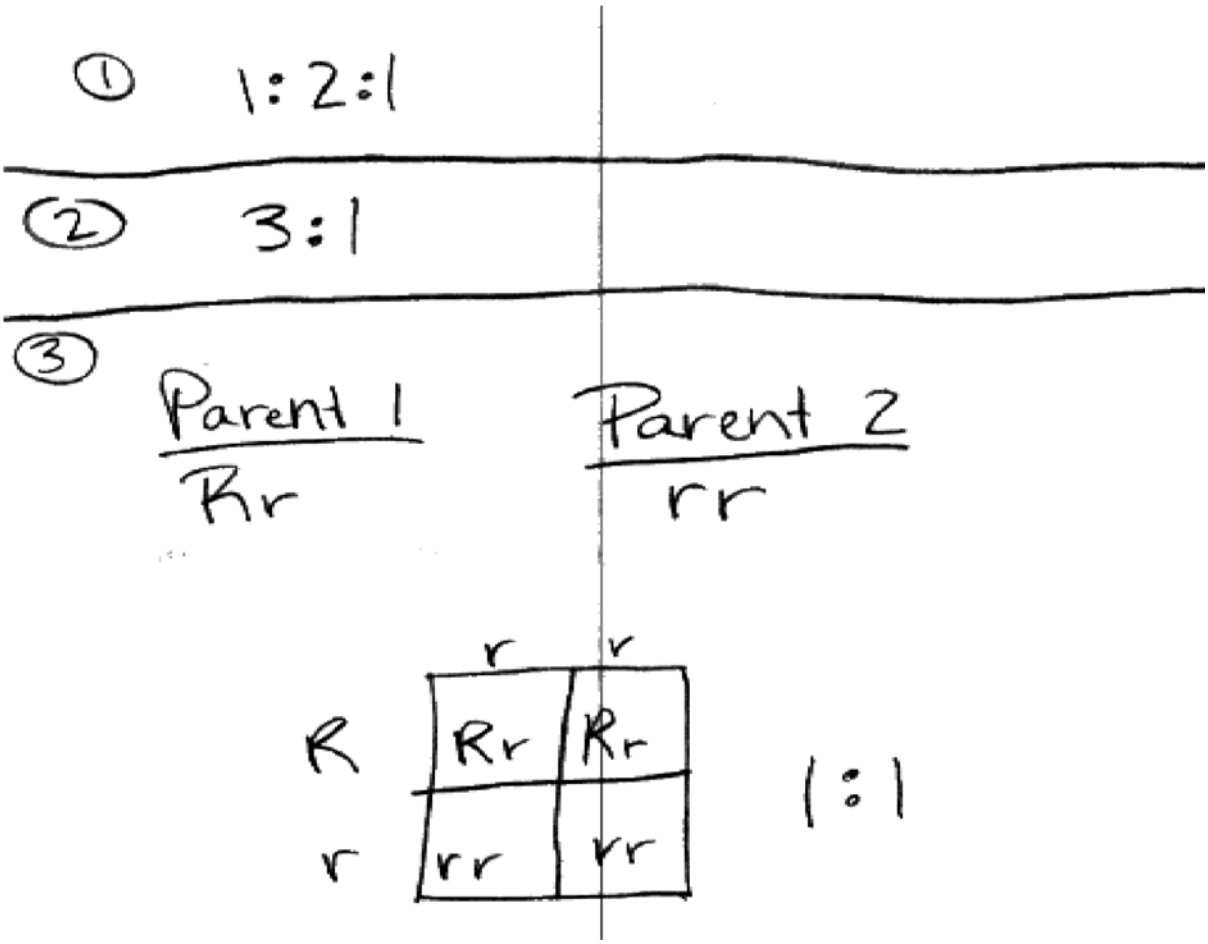
Part	Points
1	**1 point possible:** **1 point for the genotypic ratio:** 1:2:1 **OR** 25% RR, 50% Rr, and 25% rr
2	**1 point possible:** **1 point for the phenotypic ratio:** 3:1 **OR** 75% round and 25% wrinkled
3	**2 points possible:** **1 point for each parent genotype:** Rr x rr

SCORE POINT: 4

Part 1		**Points**
Correct prediction:	"1:2:1"	1

Part 2		**Points**
Correct prediction:	"3:1"	1

Part 3		**Points**
Correct genotypes:	"Rr" "rr"	2
	Total Points	4

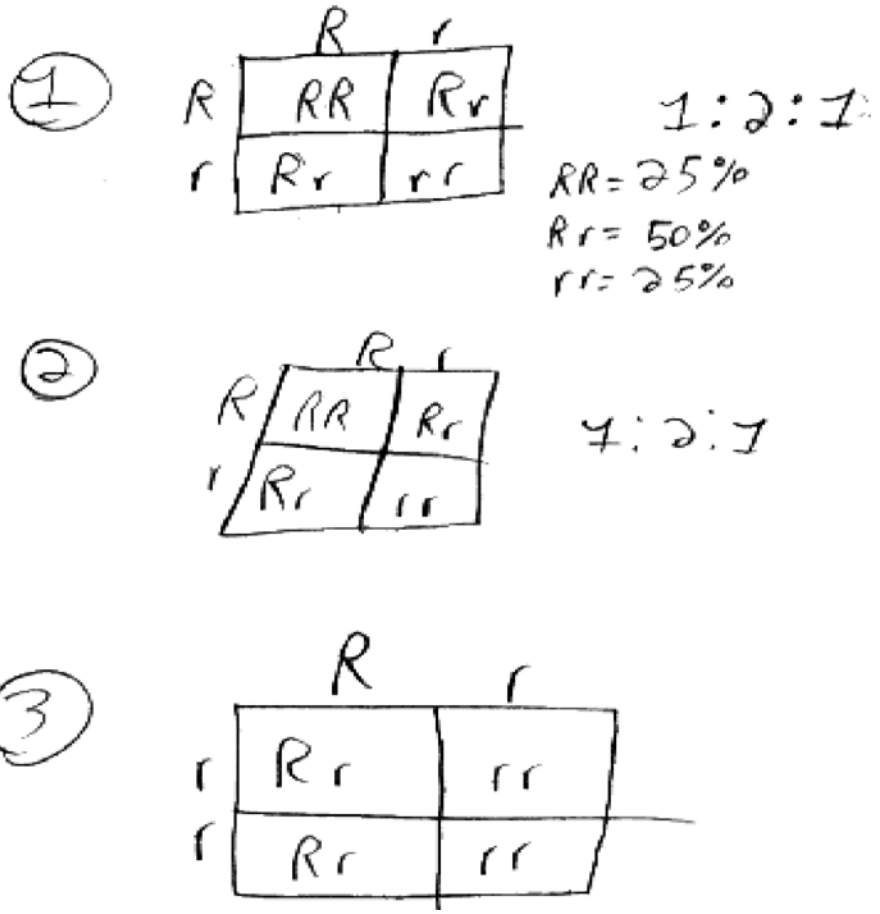


SCORE POINT: 3

Part 1		**Points**
Correct prediction:	"1:2:1"	1

Part 2		**Points**
Incorrect prediction:	"1:2:1"	-

Part 3		**Points**
Correct genotypes:	"Rr" "rr"	2
	Total Points	3

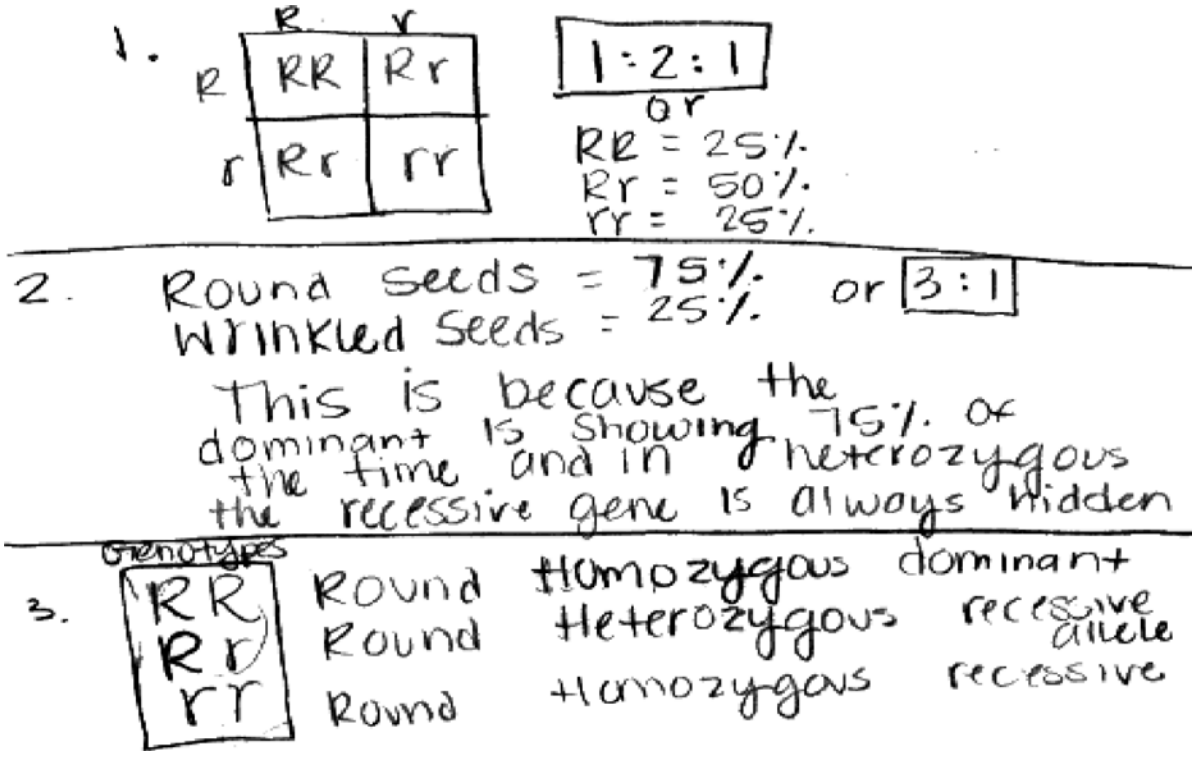


SCORE POINT: 2

Part 1		**Points**
Correct prediction:	1 : 2 : 1 or RR= 25% Rr = 50% rr = 25%	1

Part 2		**Points**
Correct prediction:	Round seeds = 75% or 3 : 1 Wrinkled seeds = 25%	1

Part 3		**Points**
Incorrect genotypes:	RR Rr rr	--
	Total Points	2

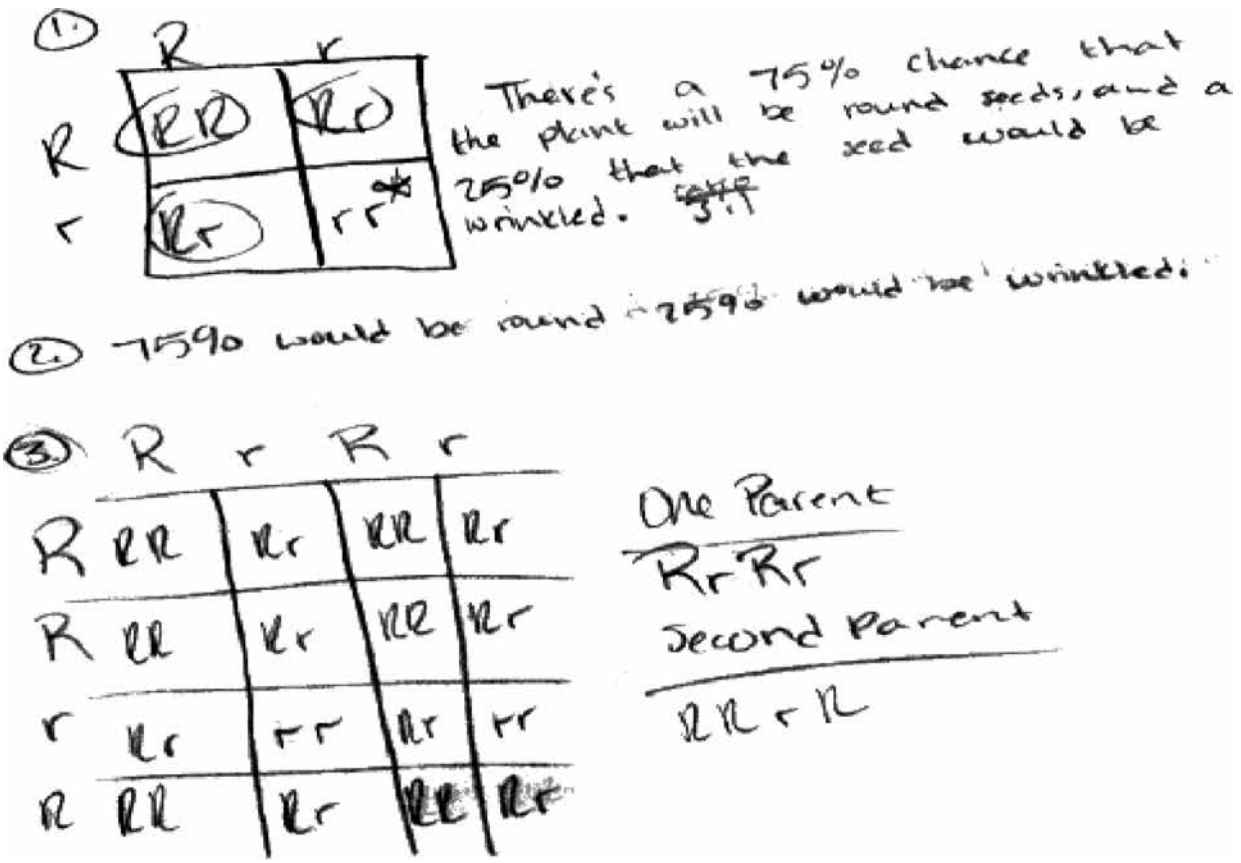


SCORE POINT: 1

Part 1		**Points**
Incorrect prediction:	"75% chance that the plant will be round seeds, and a 25% that the seed would be wrinkled"	-

Part 2		**Points**
Correct prediction:	"75% would be round 25% would be wrinkled"	1

Part 3		**Points**
Incorrect genotypes:	"RrRr" "RRrR"	-
	Total Points	1

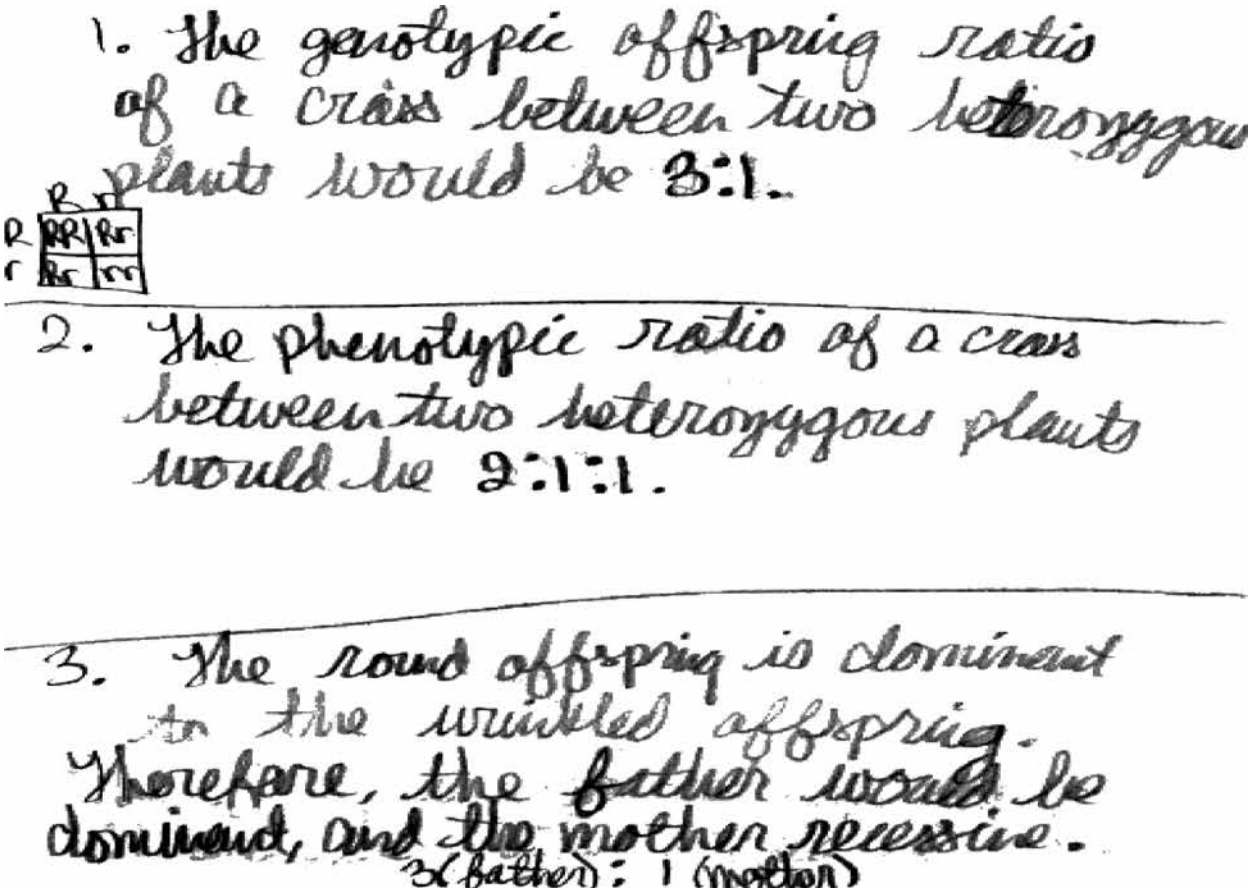


SCORE POINT: 0

Part 1		**Points**
Incorrect prediction:	"3:1"	-

Part 2		**Points**
Incorrect prediction:	"2:1:1"	-

Part 3		**Points**
Incorrect genotypes:	"the father would be dominant, and the mother recessive"	-
	Total Points	0



B. Listed below are some important properties of water:

- **surface tension**
- **adhesion**
- **cohesion**
- **polarity**
- **pH**

1. Choose one of the properties listed above. Describe an example of how water demonstrates this property.

2. Explain how the property chosen in part 1 is significant for life.

3. Choose another one of the properties listed above. Describe an example of how water demonstrates this property.

4. Explain how the property chosen in part 3 is significant for life.

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

Item B Scoring Rubric—2014 Biology

Part	Points
1	1 point possible: Describes one example of one property of water.
2	1 point possible: Explains how this property is significant for life.
3	1 point possible: Describes one example of one property of water.
4	1 point possible: Explains how this property is significant for life.

Score	Description
4	Response shows a *complete understanding* of investigation of the properties and importance of water and its significance for life. The student answers correctly and responds to all parts of the task.
3	Response shows a *nearly complete understanding* of investigation of the properties and importance of water and its significance for life. The student presents nearly all answers correctly and responds to all parts of the task. The response may contain minor errors.
2	Response shows a *limited understanding* of investigation of the properties and importance of water and its significance for life. The student answers some questions correctly and responds correctly to most parts of the task. The response may contain a major error.
1	Response shows a *minimal understanding* of investigation of the properties and importance of water and its significance for life. The student presents some correct work that contributes to a correct answer. The response contains incomplete answers and major errors.
0	Response shows *insufficient understanding* of investigation of the properties and importance of water and its significance for life. The reader may not be able to understand how and why decisions were made.
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.)

SOLUTION AND SCORING

4 points possible:

Part	Points	
1 and 3	**1 point possible for each part:**	
	Property	**Description**
	Cohesion	The ability of water molecules to bond to each other. **OR** Water droplets are nearly spherical because of cohesion. **OR** Water exhibits this property through surface tension. **OR** Water droplets combine with each other.
	Surface tension	Allows water to resist an external force due to the cohesive nature of the water molecules. **OR** Allows certain organisms to glide over the surface of water. **OR** Allows a cup to be filled above its rim.
	Adhesion	The ability of water to adhere to other substances/surfaces. **OR** Capillary action — Water can climb up small tubes due to adhesion. **OR** Meniscus — The clinging of water to the sides of a test tube is due to adhesion.

Part	Points	
	Polarity	Molecules having uneven distribution of charges (a labeled diagram will be accepted) **OR** Hydrogen bonds form between water molecules as a result of polarity.
	pH	pH of pure water is 7 or neutral.
2 and 4	**1 point possible for each correct explanation:**	
	Property	Explanation of significance for life
	Cohesion	Cohesion contributes to the transport of water against the force of gravity in plants.
	Surface tension	Insects or certain lizards can travel on water to hunt or escape predators.
	Adhesion	Adhesion contributes to the transport of water against the force of gravity in plants.
	Polarity	Water is the universal solvent because of its polarity, which is significant to life because metabolic reactions take place in solution in the cytoplasm of living cells. **OR** Water has a specific heat resulting in: bodies of water being more resistant to temperature change and the internal environment of organisms being able to resist changes in temperature that could result in damage. **OR** Ice is less dense than water as a result of the hydrogen bonds formed. Ice acts as an insulator which is important for the survival of aquatic organisms.
	pH	Water's neutral pH allows organisms to use water in metabolism. **OR** Water can become slightly acidic (acid rain) or slightly basic which may disrupt normal metabolism or prevent organisms from inhabiting affected bodies of water.

SCORE POINT: 4

Part 1		**Points**
Correct description:	"Cohesion…water seems to stick to other water."	1

Part 2		**Points**
Correct explanation:	"plants use cohesion to pull water up their stem/trunk against gravity"	1

Part 3		**Points**
Correct description:	"Polarity…demonstrates this property by it's tendency to form hydrogen bonds"	1

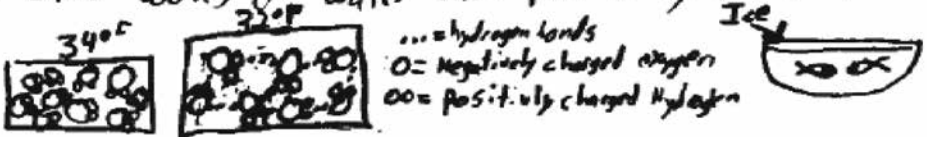
Part 4		**Points**
Correct explanation:	"when water is frozen it becomes less dense…insulates lakes & other bodies of water thus preventing them from freezing solid"	1
	Total Points	4

1. Cohesion - water demonstrates this function quite simply because water seems to stick to other water, this is caused by hydrogen bonds which are formed amongst water molecules.

2. This property is significant for life because plants use cohesion to pull water up their stem/trunk against gravity.

3. Polarity - water demonstrates this property by it's tendency to form hydrogen bonds. The charge of a water molecule looks like this  and is caused by the unequal electron sharing.

4. The polarity of water is important because when water is frozen it becomes less dense than 34°F water for instance, thus causing the ice to float. This is important because it insulates lakes & other bodies of water thus preventing them from freezing solid.



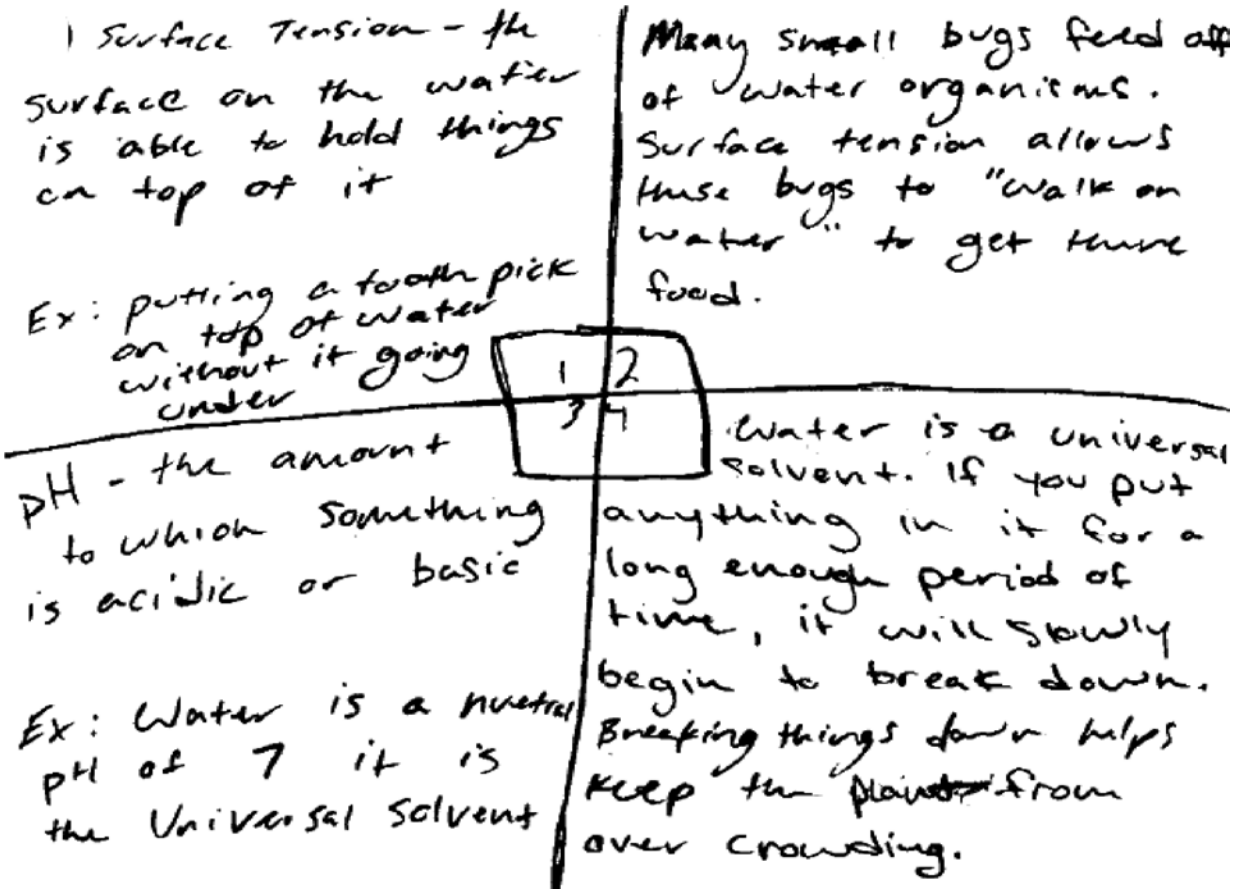
SCORE POINT: 3

Part 1		**Points**
Correct description:	"Surface Tension – the surface on the water is able to hold things on top of it."	1

Part 2		**Points**
Correct explanation:	"Surface tension allows these bugs to 'walk on water' to get there food."	1

Part 3		**Points**
Correct description:	"Water is a neutral pH of 7."	1

Part 4		**Points**
Incorrect explanation:	"Water is a universal solvent. If you put anything in it for a long enough period of time, it will slowly begin to break down."	-
	Total Points	3



SCORE POINT: 2

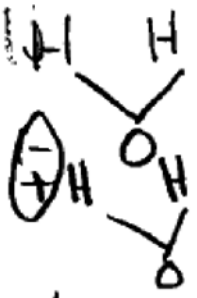
Part 1		**Points**
Correct description:	"Cohesion is When Water sticks to water."	1

Part 2		**Points**
Incorrect explanation:	"The more water we get, the Will increase and can be used over and over again."	-

Part 3		**Points**
Correct description:	"Adhesion is When Water sticks to other objects."	1

Part 4		**Points**
Incorrect explanation:	"It is significant by giving it to plants so they can grow and use Photosynthesis."	-
	Total Points	2

1. Cohesion is When Water sticks to water.



In this drawing the negative is attracted by the positive Hydrogen. So that is how water sticks to water.

2. The more water we get, the Will increase and can be used over and over again.

3. Adhesion is When water sticks to other objects. An example would be water sticking to plants or cells.

4. It is significant by giving it to plants so they can grow and can use Photosynthesis. And in the cell they follow salt which is Osmosis.

SCORE POINT: 1

Part 1		**Points**
Incorrect description:	"pH: tells you whether a liquid is an acid or a base. Water usually has a pH which tells us if it is acidic or a base"	-

Part 2		**Points**
Incorrect explanation:	"significant for life because without this, we could be drinking really high acids and not no it"	-

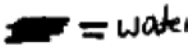
Part 3		**Points**
Correct description:	"Cohesion in water is when you have water filled to the top of the cup but wont pour over"	1

Part 4		**Points**
Incorrect explanation:	"significant for life because it helps things stick"	-
	Total Points	1

1. pH: This is used in the pH scale this tells you whether a liquid is an acid or a base. Water usually has a pH which tells us if it is acidic or a base.

2. The pH property is significant for life because without this, we could be drinking really high acids and not no it.

3. Cohesion in water is when you have water filled to the top of the cup but wont pour over



4. Cohesion is significant for life because it helps things stick.

SCORE POINT: 0

Part 1		**Points**
Incorrect description:	"surface tension – water demonstrates this when water is spilled on the counter top"	-

Part 2		**Points**
Incorrect explanation:	"without surface tension we would not have oceans, or lakes…"	-

Part 3		**Points**
Incorrect description:	"polarity – when water freezes"	-

Part 4		**Points**
Incorrect explanation:	"some animals need to live in environments that are cold and frozen, such as polar bears."	-
	Total Points	0

1. surface tension - water demonstrates this when water is spilled on the counter top.

2. without surface tension, we would not have oceans, or lakes which provide us withe the water we need to live.

3. polarity - when water freezes

4. some animals need to live in environments that are cold and frozen, such as polar bears.

C. Field studies have shown that predator-prey relationships help to control populations within ecosystems. If coyotes were removed from the Ouachita National Forest in Arkansas, populations of other species would be affected.

1. Identify one population that could increase as a result of the removal of coyotes from Ouachita National Forest. Explain why this population would experience an increase in numbers.

2. Identify one population that could decrease as a result of the removal of coyotes from Ouachita National Forest. Explain why this population would experience a decrease in numbers.

BE SURE TO LABEL YOUR RESPONSES 1 AND 2.

Item C Scoring Rubric—2014 Biology

Part	Points
1	2 points possible: 1 point for the identification of one population that could increase as a result of the removal of coyotes from Ouachita National Forest. 1 point for the explanation why this population would experience an increase in numbers.
2	2 points possible: 1 point for the identification of one population that could decrease as a result of the removal of coyotes from Ouachita National Forest. 1 point for the explanation why this population would experience a decrease in numbers.

Score	Description
4	Response shows a *complete understanding* of factors that control population. The student answers correctly and responds to all parts of the task.
3	Response shows a *nearly complete understanding* of factors that control population. The student presents nearly all answers correctly and responds to all parts of the task. The response may contain minor errors.
2	Response shows a *limited understanding* of factors that control population. The student answers some questions correctly and responds correctly to most parts of the task. The response may contain a major error.
1	Response shows a *minimal understanding* of factors that control population. The student presents some correct work that contributes to a correct answer. The response contains incomplete answers and major errors.
0	Response shows *insufficient understanding* of factors that control population. The reader may not be able to understand how and why decisions were made.
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.)

SOLUTION AND SCORING

4 points possible:

<table>
<tr><th>Part</th><th>Points</th></tr>
<tr><td>1</td><td>2 points possible:
1 point for identification:
Rabbit Turkey Beaver
Squirrel Quail Skunk
Woodchuck Raccoon Bobcat
Deer Opossum Otter
Mouse Ground Hog Lizard
Rat Chipmunk Vulture
Crow Fox Hawk

1 point for explanation:

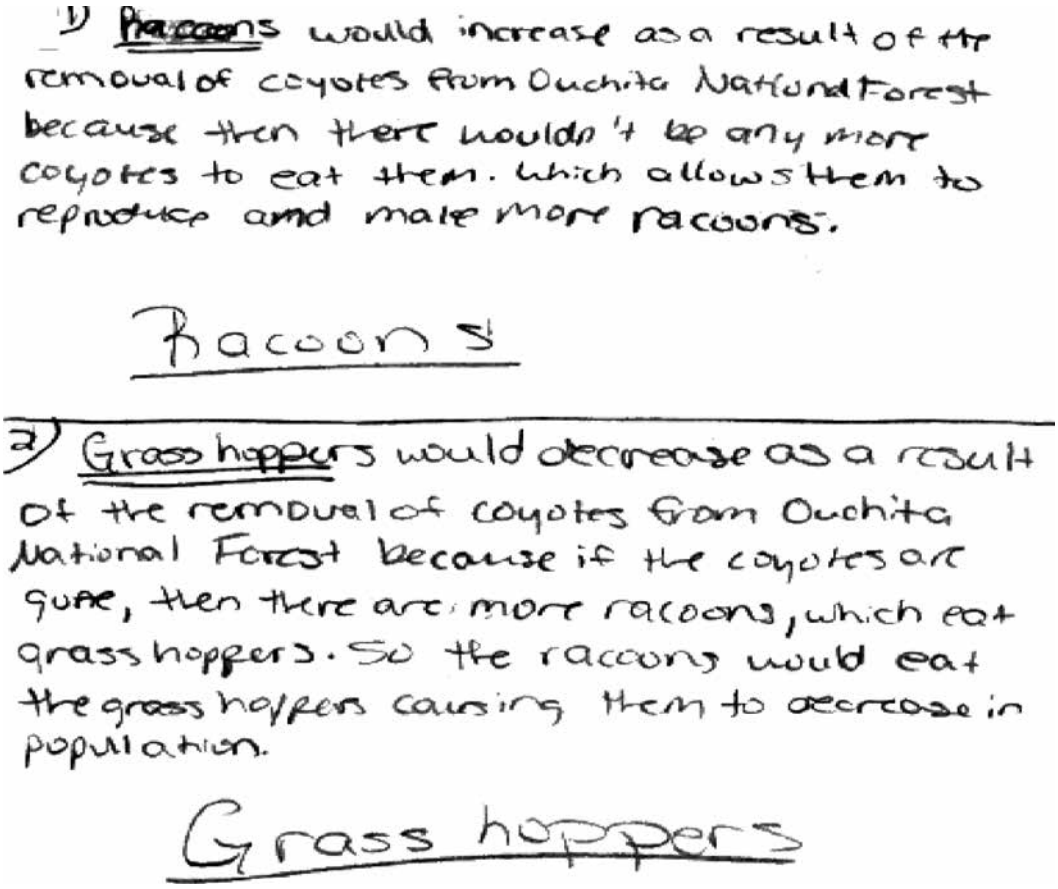
The coyote is a predator that eats (named prey). If the predator is gone the number of prey increases. They have an inverse relationship.</td></tr>
<tr><td>2</td><td>2 points possible:
1 point for identification:
Bear Cougar
Note: Food sources of coyote prey will also decrease as their numbers increase.

1 point for explanation:
The coyote is a source of food. Less prey means fewer predators of the coyote.</td></tr>
</table>

SCORE POINT: 4

Part 1		**Points**
Correct identification:	"Racoons"	1
Correct explanation:	"there wouldn't be any more coyotes to eat them. Which allows them to reproduce and make more racoons"	1

Part 2		**Points**
Correct identification:	"Grasshoppers"	1
Correct explanation:	"there are more racoons, which eat grasshoppers. So the racoons would eat the grasshoppers causing them to decrease in population."	1
	Total Points	4



SCORE POINT: 3

Part 1		**Points**
Incorrect identification:	"rodent population"	-
Correct explanation:	"coyotes hunt small rodents, so if the coyotes were to be removed, these animals would overpopulate the area"	1

Part 2		**Points**
Correct identification:	"bear population"	1
Correct explanation:	"coyotes are hunted by bears, so if coyotes are removed, then the bears would have to move to find new prey or die."	1
	Total Points	3

1. I believe the rodent population would increase (mice, squirrels, etc.).

I believe coyotes hunt small rodents, so if the coyotes were to be removed, these animals would overpopulate the area.

---

2. The bear population would decrease.

I believe coyotes are hunted by bears, so if coyotes are removed, then the bears would have to move to find new prey or die.

SCORE POINT: 2

Part 1		**Points**
Incorrect identification:	"rabbits and squirrels"	-
Correct explanation:	"This population would increase because they wouldn't be the prey of the coyotes anymore and there wouldn't be as many killed."	1

Part 2		**Points**
Incorrect identification:	"tigers and bears"	-
Correct explanation:	"they wouldn't have as much prey to eat and could die from starvation or competing with each other for food."	1
	Total Points	2

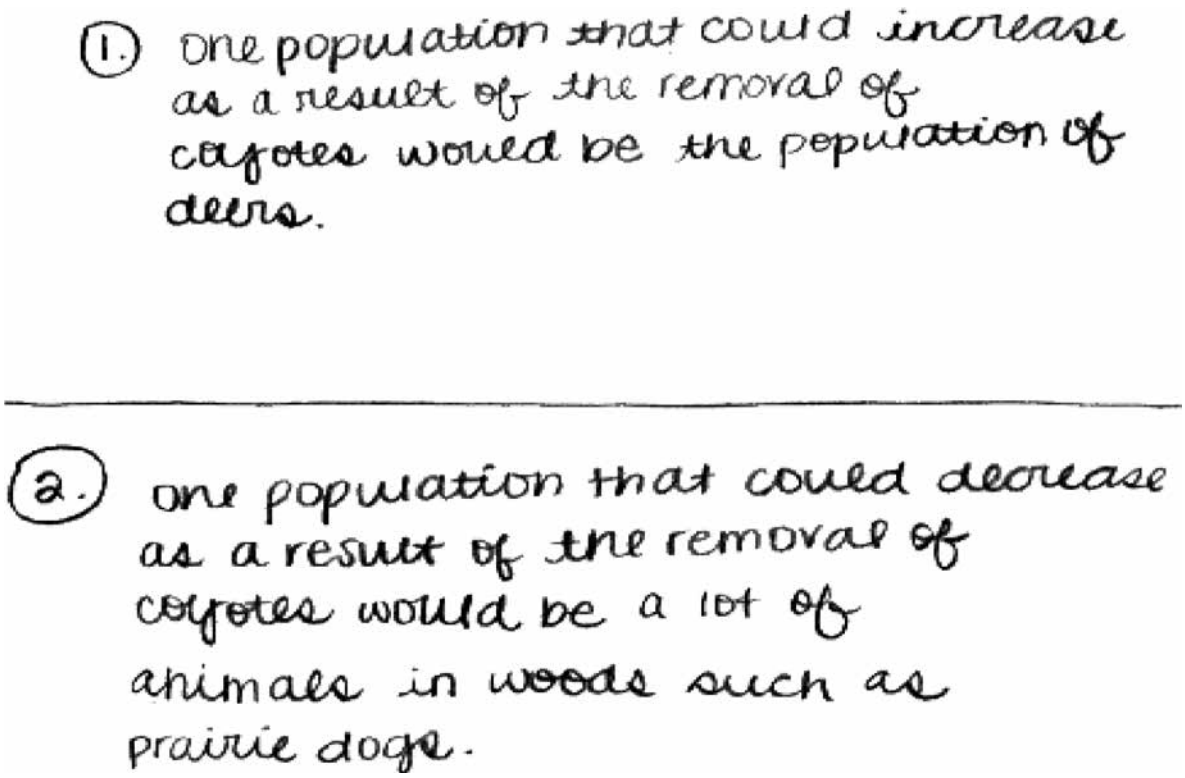
① One population that would increase is the smaller animals that the coyotes eat like rabbits and squirrels. This population would increase because they wouldn't be the prey of the coyotes anymore and there wouldn't be as many killed.

② One population that would decrease is the larger animals that eat the coyotes like the tigers and bears. This population would decrease because they wouldn't have as much prey to eat and could die from starvation or competing with each other for food.

SCORE POINT: 1

Part 1		**Points**
Correct identification:	"deers"	1
Incorrect explanation:		-

Part 2		**Points**
Incorrect identification:	"prairie dogs"	-
Incorrect explanation:		-
	Total Points	1



SCORE POINT: 0

Part 1		**Points**
Incorrect identification:	"population with grass and dry land"	-
Incorrect explanation:	"likes to be free and out in the open, so that their prey can be found easy"	-

Part 2		**Points**
Incorrect identification:	"population with a lot of trees and wet land fields"	-
Incorrect explanation:	"coyotes will have a heard time finding food"	-
	Total Points	0

1. A Population with grass and dry land fields will increase the number of coyotes. Coyotes likes to be free and out in the open, so that their Prey can be found easy. Tress and and other things will cause the Coyotes to lose Sight of their Prey.

2. A Population with a lot of trees and wet land fields will decrease the number of coyotes. With tress the coyotes will have a heard time finding food and will not have much space. Wet land fields will cause the Coyote to settled.

D. 1. List two diseases that are caused by viruses.

2. Describe one way viruses can be useful in the treatment or prevention of diseases in humans.

3. Other than treating viral diseases in humans, describe one way the study of viruses can be economically important.

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

Item D Scoring Rubric—2014 Biology

Part	Points
1	2 points possible: Lists two diseases caused by viruses.
2	1 point possible: Describes one way viruses can be useful in the treatment of disease in humans.
3	1 point possible: Describes one way the study of viruses can be economically beneficial.

Score	Description
4	Response shows a *complete understanding* of evaluating the medical and economic importance of viruses. The student answers correctly and responds to all parts of the task.
3	Response shows a *nearly complete understanding* of evaluating the medical and economic importance of viruses. The student presents nearly all answers correctly and responds to all parts of the task. The response may contain minor errors.
2	Response shows a *limited understanding* of evaluating the medical and economic importance of viruses. The student answers some questions correctly and responds correctly to most parts of the task. The response may contain a major error.
1	Response shows a *minimal understanding* of evaluating the medical and economic importance of viruses. The student presents some correct work that contributes to a correct answer. The response contains incomplete answers and major errors.
0	Response shows *insufficient understanding* of evaluating the medical and economic importance of viruses. The reader may not be able to understand how and why decisions were made.
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—2014 BIOLOGY

SOLUTION AND SCORING

4 points possible:

<table>
<tr><th>Part</th><th>Points</th></tr>
<tr><td>1</td><td>2 points possible:

1 point for each viral disease listed

<table>
<tr><td>Influenza</td><td>AIDS</td><td>West Nile</td><td>Mononucleosis</td></tr>
<tr><td>Common Cold</td><td>Herpes</td><td>Hanta</td><td>Genital Warts</td></tr>
<tr><td>Chicken Pox</td><td>Adenovirus</td><td>Ebola</td><td>Plantar Warts</td></tr>
<tr><td>Shingles</td><td>Rhinovirus</td><td>Encephalitis</td><td>CMV</td></tr>
<tr><td>Measles</td><td>Rotavirus</td><td>RSV</td><td>Hand, Foot, and Mouth Or Coxsakie Disease</td></tr>
<tr><td>Mumps</td><td>Norwalk (Norovirus)</td><td>Epstein Barr</td><td></td></tr>
<tr><td>Rubella</td><td>Hepatitis A, B, C</td><td>HSV</td><td>Conjunctivitis</td></tr>
<tr><td>Fifth Disease</td><td>Meningitis</td><td>HTLV I, II, or III</td><td>Herpangia</td></tr>
<tr><td>Polio</td><td>Pneumonia</td><td>Yellow Fever</td><td>Hunt Syndrome</td></tr>
<tr><td>Smallpox</td><td>SARS</td><td>Dengue Fever</td><td></td></tr>
</table>
</td></tr>
<tr><td>2</td><td>1 point possible:

Develop vaccines to prevent viral disease

OR

Prevent cancer (HPV)

OR

Gene Therapy — replace “defective” genes with normal genes.

OR

Target, infect, and destroy pathogenic bacteria.

OR

VDEPT –Virus directed enzyme prodrug therapy/Drugs are delivered via a virus to help kill cancer cells.</td></tr>
</table>

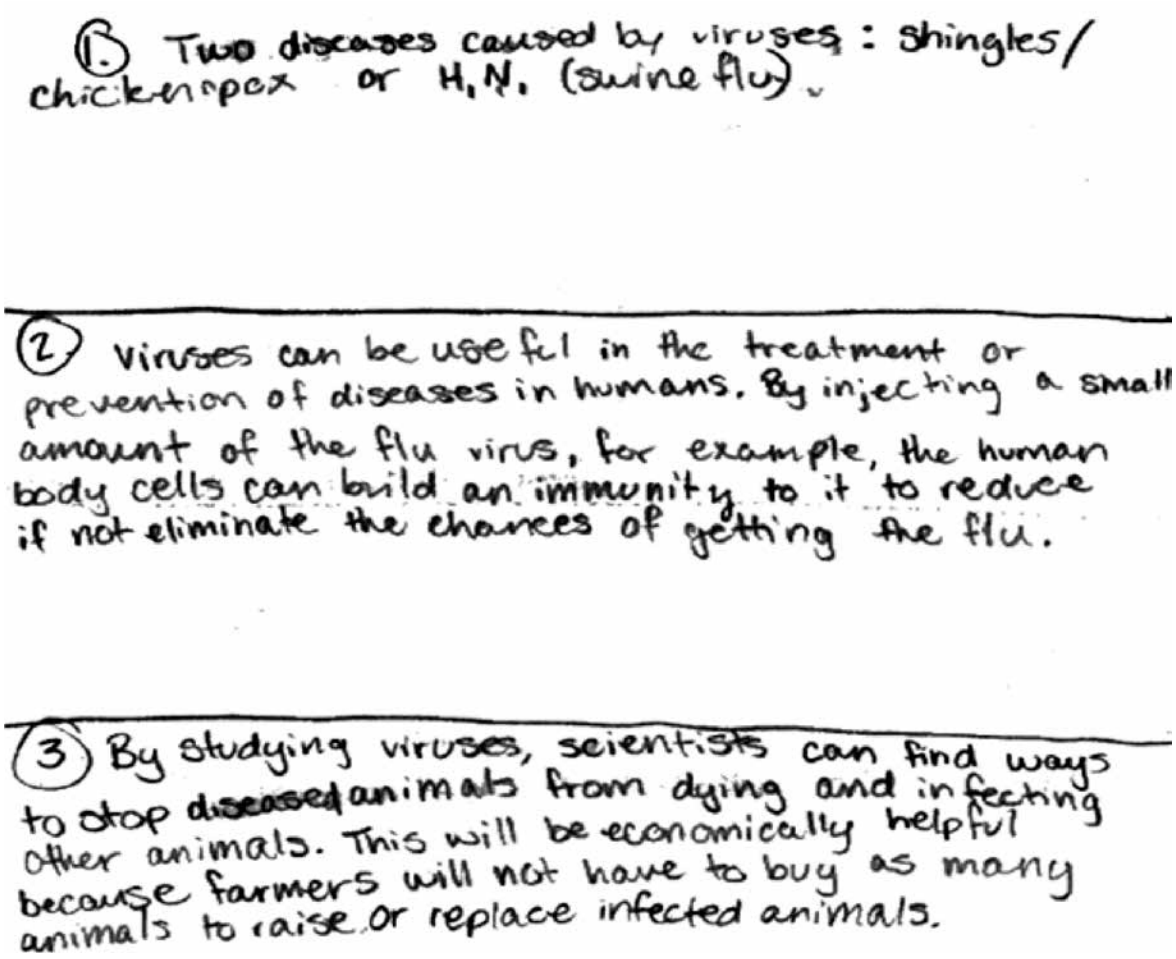
Part	Points
3	**1 point possible:** Biological pest control for better crop yield means more money for farmers. (used to control insects and rabbits) **OR** Prevention of disease by vaccination, saves money on future medical bills. **OR** Crops or livestock may be infected by viruses. Healthier crops and livestock increase profits for the farmer. **OR** Prevent certain types of cancer (HPV), saving money on health care costs. **OR** Gene Therapy, economically important to the companies that develop these methods. **OR** VDEPT- Therapy can be sold for profit. **OR** Viruses are used in research to study how genes work. Discoveries may be sold. **OR** Studying how viruses are transmitted from person to person or animal to person can keep less people from getting sick allowing them to be more productive and use less sick time.

SCORE POINT: 4

Part 1		**Points**
Correct disease:	"shingles" OR "chicken pox"	1
Correct disease:	"swine flu"	1

Part 2		**Points**
Correct description:	"By injecting a small amount of flu virus, for example, the human body cells can build an immunity to it to reduce if not eliminate the chances of getting the flu."	1

Part 3		**Points**
Correct description:	"find ways to stop diseased animals from dying and infecting other animals...farmers will not have to buy as many animals to raise or replace infected animals."	1
	Total Points	4

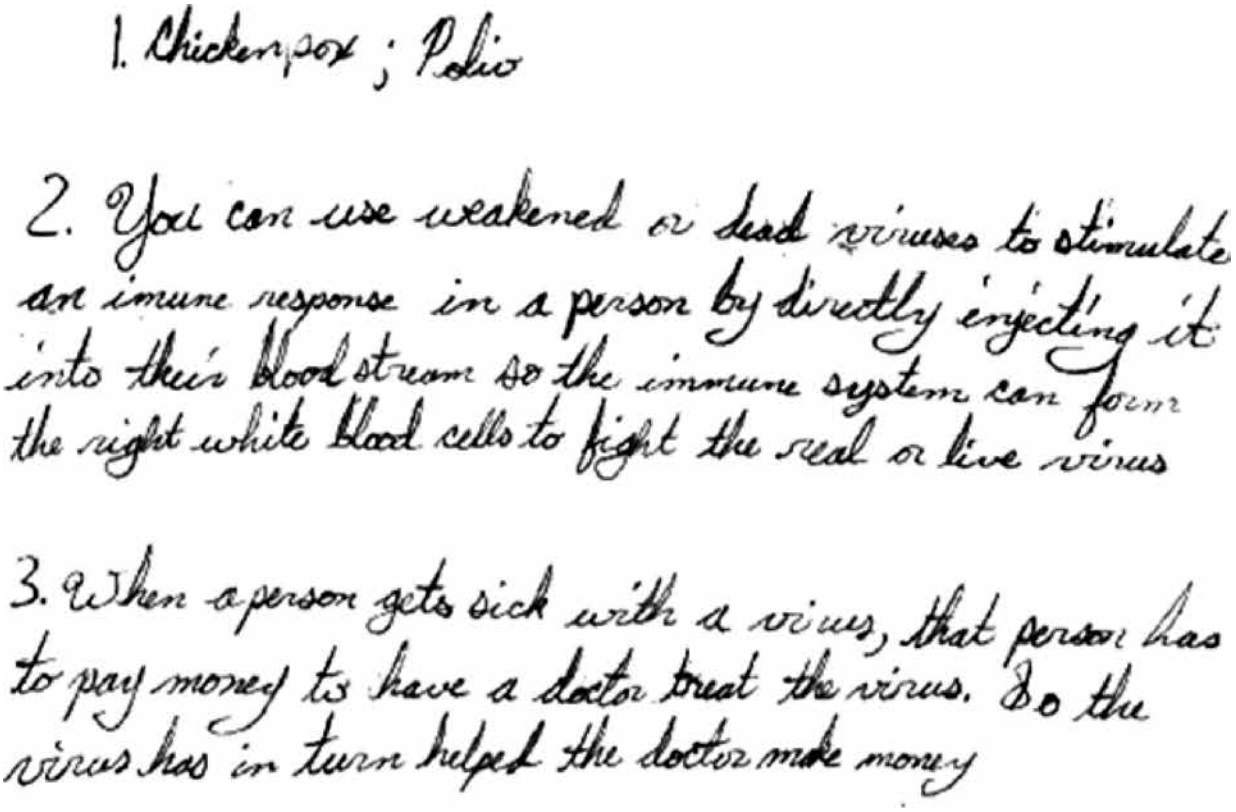


SCORE POINT: 3

Part 1		**Points**
Correct disease:	"Chicken pox"	1
Correct disease:	"Polio"	1

Part 2		**Points**
Correct description:	"You can use weakened or dead viruses to stimulate an imune response in a person by directly injecting it "	1

Part 3		**Points**
Incorrect description:	"When a person gets sick with a virus, that person has to pay money to have a doctor treat the virus."	-
	Total Points	3

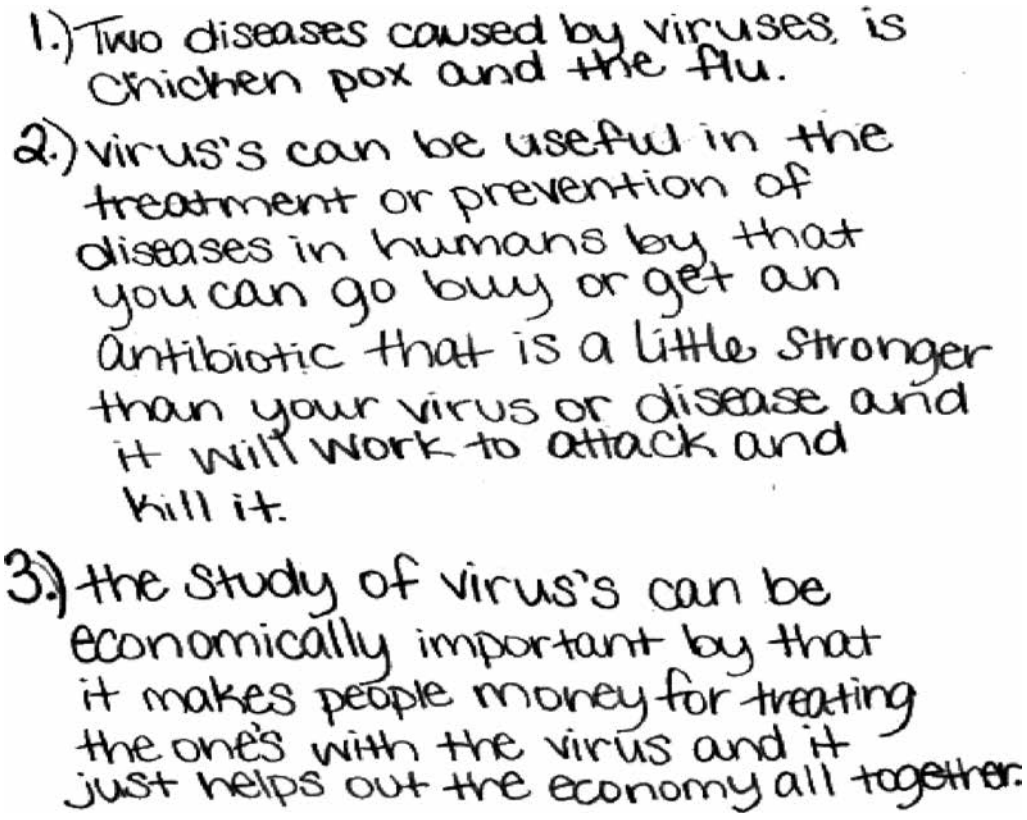


SCORE POINT: 2

Part 1		**Points**
Correct disease:	"chicken pox"	1
Correct disease:	"flu"	1

Part 2		**Points**
Incorrect description:	"you can go buy or get an antibiotic that is a little stronger than your virus"	-

Part 3		**Points**
Incorrect description:	"it makes people money for treating the one's with the virus"	-
	Total Points	2


1.) Two diseases caused by viruses is Chicken pox and the flu.

2.) virus's can be useful in the treatment or prevention of diseases in humans by that you can go buy or get an antibiotic that is a little stronger than your virus or disease and it will work to attack and kill it.

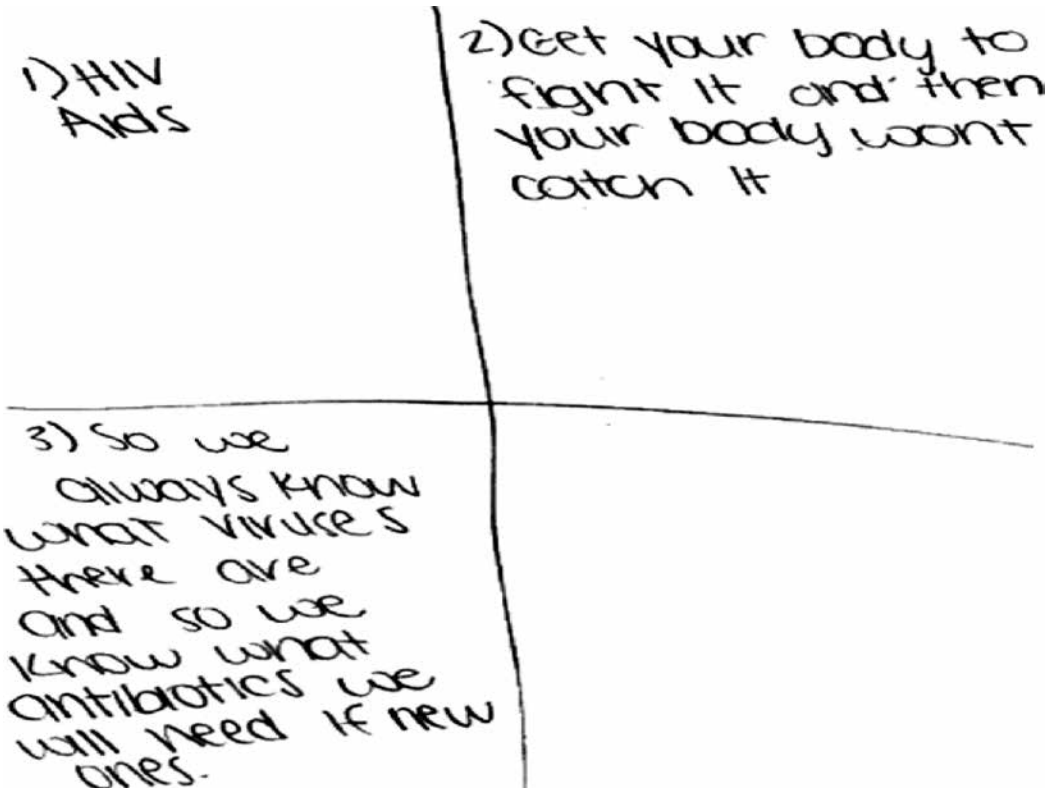
3.) the study of virus's can be economically important by that it makes people money for treating the one's with the virus and it just helps out the economy all together.

SCORE POINT: 1

Part 1		**Points**
Correct disease:	"HIV Aids"	1
Incorrect disease:		

Part 2		**Points**
Incorrect description:	"Get your body to fight it and then your body wont catch it"	-

Part 3		**Points**
Incorrect description:	"So we always know what viruses there are and so we know what antibiotics we will need"	-
	Total Points	1

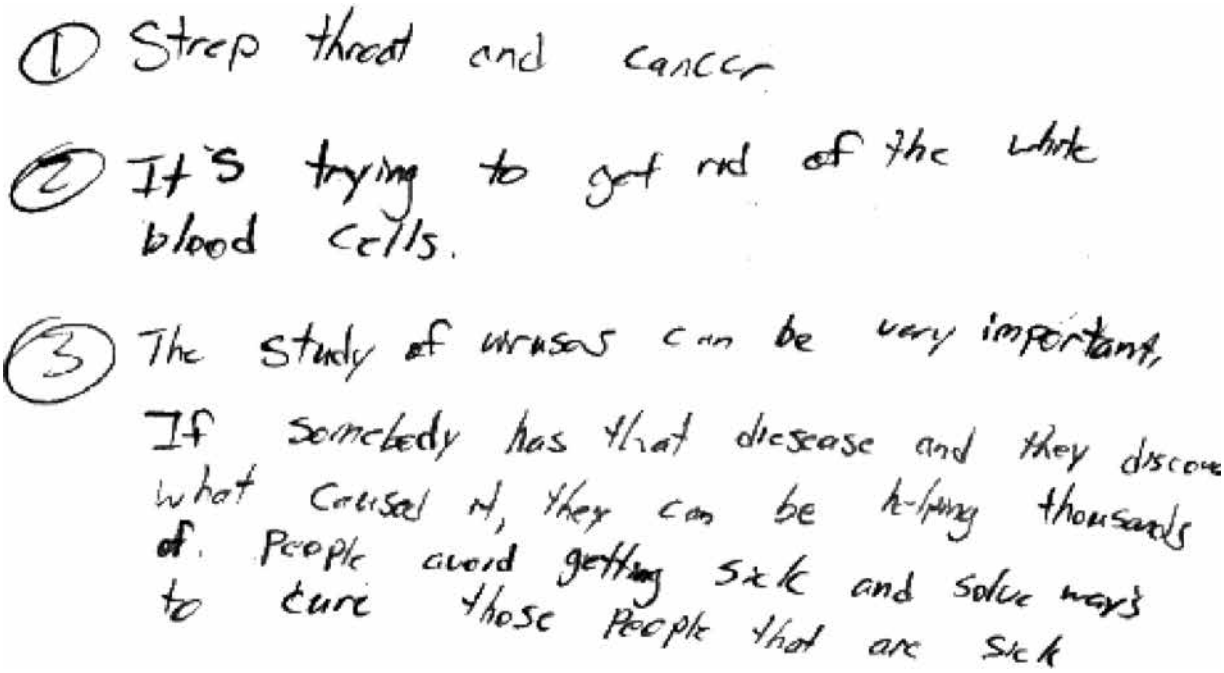


SCORE POINT: 0

Part 1		**Points**
Incorrect disease:	"Strep throat"	-
Incorrect disease:	"Cancer"	-

Part 2		**Points**
Incorrect description:	"It's trying to get rid of the white blood cells."	-

Part 3		**Points**
Incorrect description:	"If somebody has that disease and they discover what caused it, they can be helping thousands of people"	-
	Total Points	0



E. 1. Describe the conditions under which a scientific theory may be modified.

2. Describe peer review as a guideline for science.

3. Describe two benefits that peer review of scientific investigations provide for the advancement of scientific knowledge.

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

Item E Scoring Rubric—2014 Biology

Part	Points
1	1 point possible: Describes the conditions under which a scientific theory may be modified.
2	1 point possible: Describes peer review as a guideline for science.
3	2 points possible: Describes two benefits that peer review of scientific investigations provides for the advancement of scientific knowledge.

Score	Description
4	Response shows a *complete understanding* of the guidelines of science. The student answers correctly and responds to all parts of the task.
3	Response shows a *nearly complete understanding* of the guidelines of science. The student presents nearly all answers correctly and responds to all parts of the task. The response may contain minor errors.
2	Response shows a *limited understanding* of the guidelines of science. The student answers some questions correctly and responds correctly to most parts of the task. The response may contain a major error.
1	Response shows a *minimal understanding* of the guidelines of science. The student presents some correct work that contributes to a correct answer. The response contains incomplete answers and major errors.
0	Response shows *insufficient understanding* of the guidelines of science. The reader may not be able to understand how and why decisions were made.
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—2014 BIOLOGY

SOLUTION AND SCORING

4 points possible:

Part	Points
1	**1 point possible:** A scientific theory may be modified when new data is discovered through research and/or new technology.
2	**1 point possible:** Scientists present their work (includes hypothesis, experiments, results, and conclusions) to their peers in a presentation or in a written article. Their peers have a chance to evaluate the work of the scientists (replicate their findings through experimentation) and then make a recommendation to accept, modify, or reject the scientist's work.
3	**2 points possible:** **1 point each for benefit of peer review:** Peer review can identify any bias or conflict of interest. **OR** Peer review can identify errors in the experimentation (process). **OR** Peer review can identify errors on the conclusion(s) made by the scientists. **OR** Peer review can validate the data presented by the scientist(s). **OR** Peer review can confirm that enough information has been provided by the publishing scientist to replicate his/her experiments.

SCORE POINT: 4

Part 1		**Points**
Correct description:	"if future scientific evidence is found that disproves portions of that theory"	1

Part 2		**Points**
Correct description:	"allows scientists' colleagues to review and duplicate experiments or observations"	1

Part 3		**Points**
Correct benefit:	"to validate sometimes faulty experiments, preventing a biased or incorrect result"	1
Correct benefit:	"to pool their knowledge enabling much faster advancements"	1
	Total Points	4

1). A theory may be modified if future scientific evidence is found that disproves portions of that theory.

2). Peer review allows scientists' colleagues to review and duplicate experiments or observations, they can find mistakes and correct them thus improving resultant theories or hypotheses.

3). Peer review benefits science as it enables a community of scientists to validate sometimes faulty experiments, preventing a biased or incorrect result.

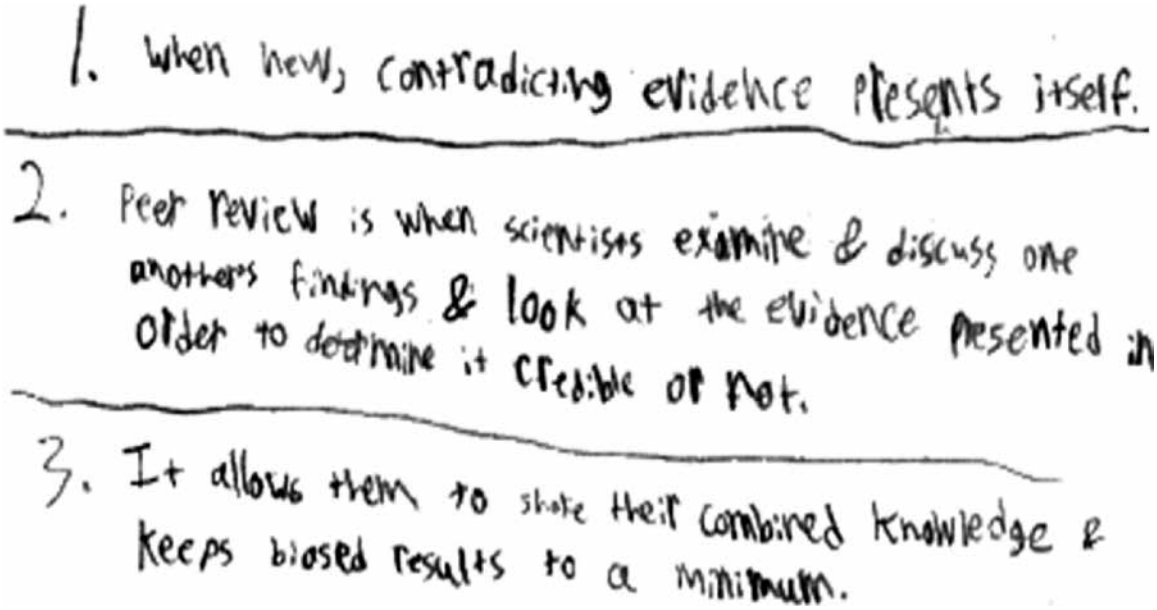
Peer review also allows scientists to pool their knowledge enabling much faster advancements in technology and experiments.

SCORE POINT: 3

Part 1		**Points**
Correct description:	"When new, contradicting evidence presents itself."	1

Part 2		**Points**
Correct description:	"when scientists examine & discuss another's findings & look at the evidence presented in order to determine it credible or not."	1

Part 3		**Points**
Correct benefit:	"It allows them to share their combined knowledge & keeps biased results to a minimum."	1
Incorrect benefit:		-
	Total Points	3

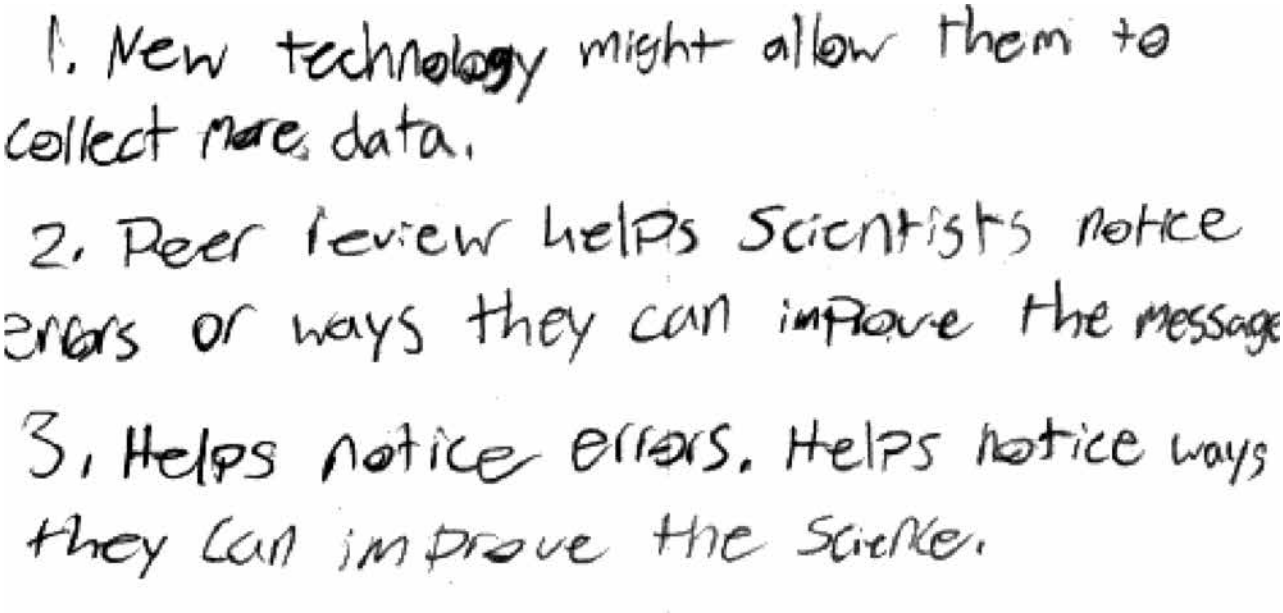


SCORE POINT: 2

Part 1		**Points**
Correct description:	"New technology might allow them to collect more data."	1

Part 2		**Points**
Incorrect description:	"helps scientists notice errors or ways they can improve the message"	-

Part 3		**Points**
Correct benefit:	"Helps notice errors."	1
Incorrect benefit:	"Helps notice ways they can improve science."	-
	Total Points	2

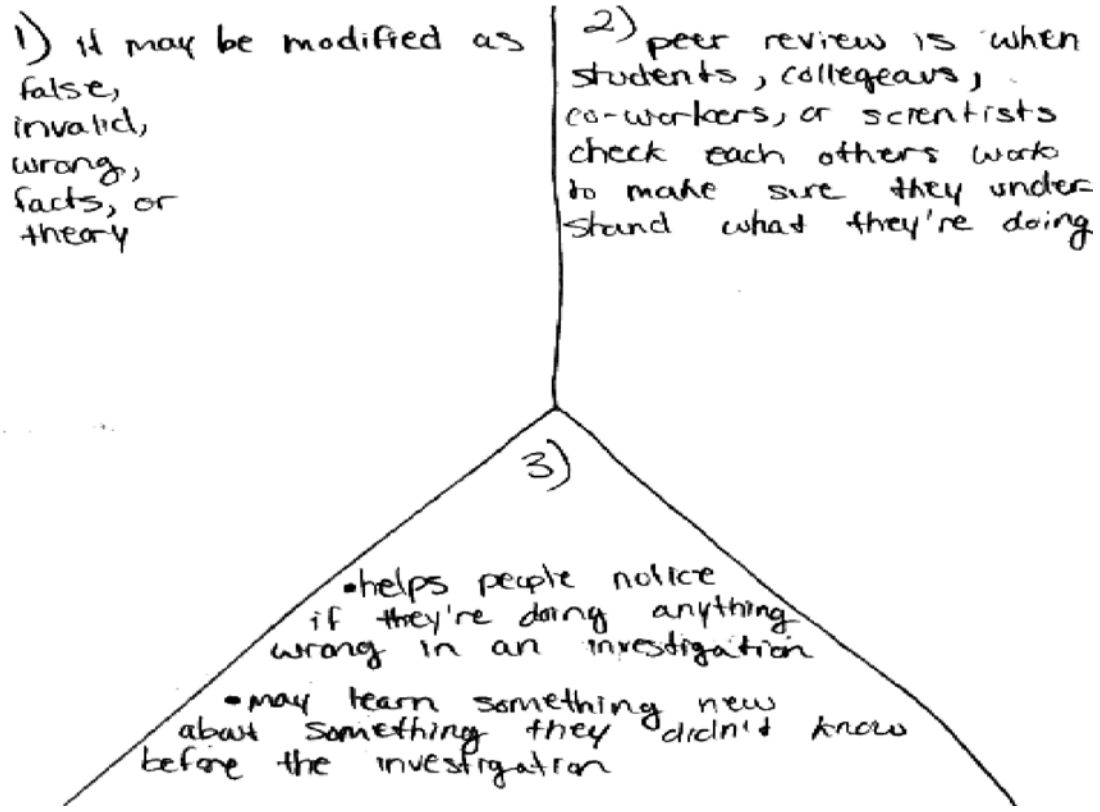


SCORE POINT: 1

Part 1		**Points**
Incorrect description:	"it may be modified as false, invalid, wrong, facts, or theory"	-

Part 2		**Points**
Incorrect description:	"students, collegeaus, co-workers, or scientists check each others work to make sure they understand what they're doing"	-

Part 3		**Points**
Correct benefit:	"helps people notice if they're doing anything wrong in an investigation"	1
Incorrect benefit:	"may learn something new"	-
	Total Points	1

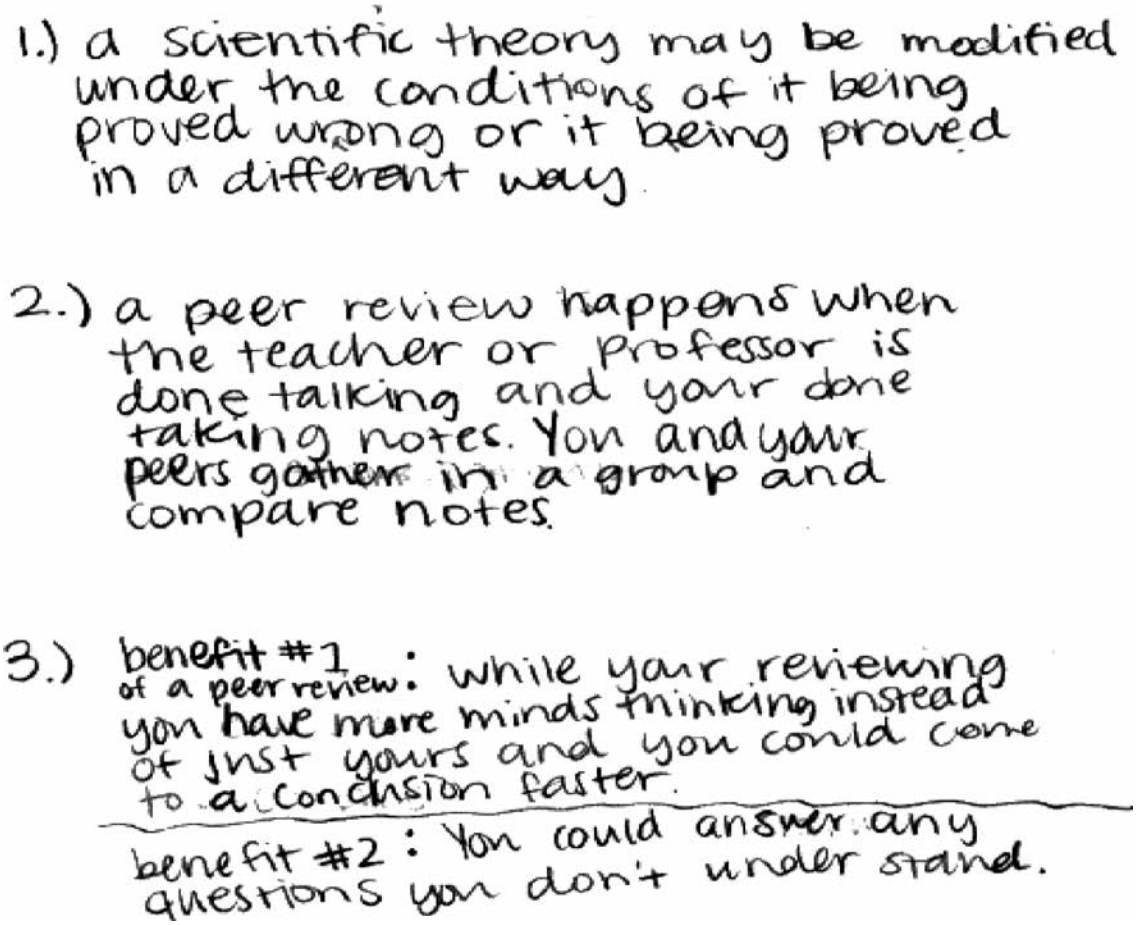


SCORE POINT: 0

Part 1		**Points**
Incorrect description:	"under the conditions of it being proved wrong or it being proved in a different way"	-

Part 2		**Points**
Incorrect description:	"the teacher or professor is done talking and your done taking notes. You and your peers gather in a group and compare notes."	-

Part 3		**Points**
Incorrect benefit:	"while your reviewing you have more minds thinking instead of just yours"	-
Incorrect benefit:	"You could answer any questions you don't under stand."	-
	Total Points	0



ACTAAP

Arkansas Comprehensive Testing, Assessment, and Accountability Program

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

QAI 13273-AR1404-TH-B

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