## MCAS High School Biology
## Paper-Based Practice Test Answer Key

# Session 1

| Item Number | Reporting Category | Standard | Science Practice Category | Item Type* | Max Points | Correct Answer** |
|---|---|---|---|---|---|---|
| 1 | Molecules to Organisms | HS-LS1-3 | None | SR | 1 | A |
| 2 | Molecules to Organisms | HS-LS1-1 | C. Evidence, Reasoning, and Modeling | SR | 1 | B |
| 3 | Heredity | HS-LS3-3 | B. Mathematics and Data | SR | 1 | A |
| 4 | Molecules to Organisms | HS-LS1-6 | C. Evidence, Reasoning, and Modeling | SR | 1 | B |
| 5 | Ecology | HS-LS2-1 | None | SR | 1 | D |
| 6 | Evolution | HS-LS4-4 | B. Mathematics and Data | SR | 2 | Part A: B<br>Part B: C |
| 7 | Heredity | HS-LS3-2 | C. Evidence, Reasoning, and Modeling | SR | 1 | C |
| 8 | Molecules to Organisms | HS-LS1-6 | None | SR | 1 | B |
| 9 | Heredity | HS-LS3-1 | C. Evidence, Reasoning, and Modeling | SR | 1 | C |
| 10 | Molecules to Organisms | HS-LS1-2 | None | SR | 1 | D |
| 11 | Evolution | HS-LS4-1 | C. Evidence, Reasoning, and Modeling | SR | 1 | D |
| 12 | Ecology | HS-LS2-7 | C. Evidence, Reasoning, and Modeling | SR | 1 | A |
| 13 | Ecology | HS-LS2-1 | C. Evidence, Reasoning, and Modeling | SR | 1 | B |
| 14 | Evolution | HS-LS4-5 | C. Evidence, Reasoning, and Modeling | SR | 1 | C |
| 15 | Ecology | HS-LS2-4 | B. Mathematics and Data | SR | 2 | Part A: A<br>Part B: C |
| 16 | Ecology | HS-LS2-7 | C. Evidence, Reasoning, and Modeling | CR | 3 | see pages 3-4 |
| 17 | Heredity | HS-LS3-1 | None | SR | 1 | B |
| 18 | Molecules to Organisms | HS-LS1-1 | C. Evidence, Reasoning, and Modeling | SR | 1 | D |
| 19 | Heredity | HS-LS3-3 | C. Evidence, Reasoning, and Modeling | SR | 1 | A |
| 20 | Molecules to Organisms | HS-LS1-5 | B. Mathematics and Data | CR | 4 | see pages 5-6 |
| 21 | Evolution | HS-LS4-5 | A. Investigations and Questioning | CR | 4 | see pages 7-8 |

* Science item types are selected-response (SR) and constructed-response (CR).

**Pages 3–12 of this document provide sample student responses to constructed-response items.

## Session 2

| Item Number | Reporting Category | Standard | Science Practice Category | Item Type* | Max Points | Correct Answer** |
|---|---|---|---|---|---|---|
| 22 | Heredity | HS-LS3-1 | None | SR | 1 | D |
| 23 | Evolution | HS-LS4-1 | C. Evidence, Reasoning, and Modeling | SR | 1 | C |
| 24 | Heredity | HS-LS3-2 | None | SR | 1 | B |
| 25 | Heredity | HS-LS3-4 | C. Evidence, Reasoning, and Modeling | SR | 2 | Part A: D<br>Part B: A, B |
| 26 | Molecules to Organisms | HS-LS1-2 | C. Evidence, Reasoning, and Modeling | SR | 1 | C |
| 27 | Ecology | HS-LS2-2 | C. Evidence, Reasoning, and Modeling | SR | 1 | A |
| 28 | Heredity | HS-LS3-1 | C. Evidence, Reasoning, and Modeling | SR | 1 | A |
| 29 | Molecules to Organisms | HS-LS1-1 | A. Investigations and Questioning | SR | 1 | D |
| 30 | Ecology | HS-LS2-5 | C. Evidence, Reasoning, and Modeling | SR | 1 | A, C |
| 31 | Molecules to Organisms | HS-LS1-3 | C. Evidence, Reasoning, and Modeling | SR | 1 | B |
| 32 | Heredity | HS-LS3-4 | B. Mathematics and Data | SR | 1 | A, B |
| 33 | Evolution | HS-LS4-2 | None | SR | 1 | A |
| 34 | Evolution | HS-LS4-5 | Mathematics & Data | SR | 1 | C |
| 35 | Molecules to Organisms | HS-LS1-6 | None | SR | 1 | C |
| 36 | Ecology | HS-LS2-2 | Mathematics & Data | SR | 2 | Part A: C<br>Part B: B |
| 37 | Heredity | HS-LS3-3 | C. Evidence, Reasoning, and Modeling | CR | 3 | see pages 9-10 |
| 38 | Evolution | HS-LS4-2 | C. Evidence, Reasoning, and Modeling | SR | 1 | D |
| 39 | Molecules to Organisms | HS-LS1-2 | C. Evidence, Reasoning, and Modeling | SR | 1 | B |
| 40 | Heredity | HS-LS3-2 | None | SR | 1 | C |
| 41 | Molecules to Organisms | HS-LS1-7 | Mathematics & Data | SR | 2 | Part A: D<br>Part B: C |
| 42 | Molecules to Organisms | HS-LS1-4 | None | CR | 4 | see pages 11-12 |

* Science item types are selected-response (SR) and constructed-response (CR).

** Pages 3–12 of this document provide sample student responses to constructed-response items.

# Sample Student Responses for Constructed-Response Items

## Item 16 Sample Student Work and Scoring Guide

### Scoring Guide

| Score | Description |
|---|---|
| 3 | The response demonstrates a thorough understanding of how human activities affect biodiversity and ecosystem health. The response clearly explains how reintroducing bald eagles helped to increase the island fox population. The response clearly describes one way the island ecosystem benefited from the removal of feral pigs and clearly explains how the removal helped to increase the island fox population. The response also clearly describes another action humans could take to increase the island fox population and clearly explains how the action would increase the size of the island fox population. |
| 2 | The response demonstrates a partial understanding of how human activities affect biodiversity and ecosystem health. |
| 1 | The response demonstrates a minimal understanding of how human activities affect biodiversity and ecosystem health. |
| 0 | The response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured. |

### Score Point 3

| Part | Student Response |
|---|---|
| A | Bald eagles chased away golden eagles and didn't allow them to nest which took away a species that preyed upon island foxes causing their population to increase. |
| B | Invasive feral pigs ate the plants or producers on the island which left little food for primary consumers such as mice and grasshoppers. These primary consumers are crucial in the island foxes' diet so when feral pigs began to be removed, the populations of these primary consumers increased and the foxes had more food to grow its population. |
| C | Humans could remove skunks as they compete with the island foxes for food sources, therefore removing that species would leave even more food for island foxes allowing logistic growth in their species. |

### Score Point 2

| Part | Student Response |
|---|---|
| A | Unlike their Golden counterparts, Bald Eagles do not prey on Island Foxes, instead fishing. This allows the foxes to live longer than to lower population |
| B | Feral Pigs were invasive, and wrecked havoc on local ecosystems. One of these ways was becoming consumers of cacti, a plant which was also a food source for Island Foxes. When they were removed from the ecosystem, there was less competition for the cacti, allowing the foxes a larger share |
| C | Humans could also institute breeding programs for Island Foxes, akin to those for many threatened species. This would allow for higher survival rates in infancy, and controlled release into the wilderness, as well as easier population monitoring |

## Score Point 1

| Part | Student Response |
|---|---|
| A | The reintroducing of the bald eagles increased the Island Foxes population is because Bald eagles didn't feed on the foxe, The golden eagles did. |
| B | The removal of the feral pigs increased the Island Foxes Population is because the feal pigs dug up and ate native plants, including cactus plants and manzanita Trees. |
| C | What the people could have also done to increase the Island foxes population is to Grow more Manzanita Trees and cactus plants, it would increase the population because the mice feed on the plants and the foxes feed on the mice, so more plants means more mice, more mice means more food for the foxes. |

## Score Point 0

| Part | Student Response |
|---|---|
| A | Reintroducing bald eagles helped increse the island fox population because the foxes learned how to adapt. It also made huans get rid of the feral pigs. |
| B | All of the other animals began to thrive again once the pigs were removed. |
| C | Humans could stop them from being hunted and eaten by other animals and also other humans. |

# Item 20 Sample Student Work and Scoring Guide

## Scoring Guide

| Score | Description |
|---|---|
| 4 | The response demonstrates a thorough understanding of photosynthesis and cellular respiration. The response correctly identifies the cellular process only the flowering plants perform and also correctly identifies the cellular process that both the flowering plants and insects perform. The response correctly identifies the contents of each flask and clearly explains the reasoning. |
| 3 | The response demonstrates a general understanding of photosynthesis and cellular respiration. |
| 2 | The response demonstrates a limited understanding of photosynthesis and cellular respiration. |
| 1 | The response demonstrates a minimal understanding of photosynthesis and cellular respiration. |
| 0 | The response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured. |

## Score Point 4

| Part | Student Response |
|---|---|
| A | Photosynthesis is performed only by the flowering plants. |
| B | Cellular respiration is performed by both the flowering plants and the insects. |
| C | The flask in row 1 has no organisms because its O2 and CO2 concentrations changed by very little, if at all, after 12 hours. The flask in row 2 has one insect because its oxygen concentration decreased by 1.3% while its carbon dioxide concentration increased by 83 ppm. These changes indicate that only cellular respiration occurred, as oxygen was converted to carbon dioxide, and therefore, this flask had to only have contained one insect. However, the O2 concentration increased and the CO2 concentration decreased in the flask in row 3; photosynthesis must have occurred at a higher rate than cellular respiration. This suggests that the flask in row 3 contained two plants and one insect because photosynthesis converts CO2 into O2 and is performed only by the plants. |

## Score Point 3

| Part | Student Response |
|---|---|
| A | The process of the flowering plant that affects the levels of O2 and CO2 in the air is photosynthesis. |
| B | The process performed by both the flowering plant and insect that affects the concentration of O2 and CO2 in the air is cellular respiration. |
| C | The contents of flask one was no organisms because the oxygen levels did not change at all. The contents of flask two was one insects because the oxygen levels went down and the carbon dioxide levels went up considerably. The contents of flask three was two plants and one insect because the oxygen levels went up slightly and the carbon dioxide levels went down significantly. |

## Score Point 2

| Part | Student Response |
|---|---|
| A | The cellular process performed only by flowering plants that affects the concentrations of O2 and CO2 in the air is called photosynthesis. |
| B | The cellular process performed by both the flowering plants and the insects is called cellular respiration. |

| | |
|---|---|
| C | There were two plants and one insect in each flask. The data table shows that there is oxygen and carbon dioxide being produced. The plants produce the oxygen and the insect produces carbon dioxide. If there was one insect or no organisms in each then there would be little to none carbon dioxide and oxygen. |

## Score Point 1

| Part | Student Response |
|---|---|
| A | The cellular process performed would be photosynthesis |
| B | The cellular process performed would also be photosynthesis. |
| C | Row one = one insect because the final concentration is not the highest<br>Row two = two plants and one insect because the final concentration is the highest on the chart<br>Row three = no organisms because it has the lowest final concentration. |

## Score Point 0

| Part | Student Response |
|---|---|
| A | Cellular respiration |
| B | Photosynthesis |
| C | Row 1 – one insect. Row 2 – 2 plants & 1 insect. Row 3 – no organisms |

# Item 21 Sample Student Work and Scoring Guide

## Scoring Guide

| Score | Description |
|---|---|
| 4 | The response demonstrates a thorough understanding of the evolution of a species through natural selection. The response includes a clearly written testable question that could be answered by scientists to determine whether natural selection plays a role in the black sea turtle's color. The response correctly identifies and clearly explains one piece of evidence that scientists can use to determine whether green and black sea turtles are separate species. The response also clearly explains how geographically isolating a small group of turtles from a larger population of turtles can lead to the two populations becoming separate species. |
| 3 | The response demonstrates a general understanding of the evolution of a species through natural selection. |
| 2 | The response demonstrates a limited understanding of the evolution of a species through natural selection. |
| 1 | The response demonstrates a minimal understanding of the evolution of a species through natural selection. |
| 0 | The response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured. |

## Score Point 4

| Part | Student Response |
|---|---|
| A | Do the black turtles have a higher chance of surviving and reproducing/finding mates than the green turtles? |
| B | They can mate the two turtles and record if they produce fertile offspring or not. |
| C | If one black sea turtle and one green sea turtle successfully produce fertile offspring, this means they are the same species. If they can't produce fertile offspring, this means that the organisms are of different species. |
| D | Over time, each group of turtles will only be able to mate and reproduce with turtles from their own group. In each group, mutations will happen and natural selection will occur. After years of this evolution, each group will be so different physically and genetically that they will no longer be the same species. |

## Score Point 3

| Part | Student Response |
|---|---|
| A | Do black sea turtles get eaten by predators less often then green sea turtles because they can blend in? |
| B | One piece of evidence that scientists can use to determine whether green sea turtles and black sea turtles are separate species is wether or not they mate and produce fertile offspring with each other. |
| C | The evidence of wether or not black and green sea turtles mate can be used by scientisits to determine whether they are different species because we know that in order for organisms to be a part of the same species they need to mate and produce fertile offspring. We will know that if the black and green sea turtles mate and produce fertile offspring then they are the same species but, if they dont we will know that they are different species. |

| | |
|---|---|
| D | Geographical isolation can form two different species from one because they will not be able to mate with each other and they will evolve in different ways. |

## Score Point 2

| Part | Student Response |
|---|---|
| A | Are there any green sea turtles in the area of which the black sea turtles live? |
| B | Looking at DNA they might find something completely different within the two sea turtles populations. |
| C | If there is a major difference in the sea turtles DNA, then they could be determined as separate species. |
| D | Evolution can play a major factor in population size. If geographically the two groups of turtles are isolated, then the turtles can evolve into bigger populations. There is also less competition between the two sea turtle populations. |

## Score Point 1

| Part | Student Response |
|---|---|
| A | Does the black shell help hide the turtles from predators better than the green shell? |
| B | What the turtles eat. |
| C | It can show that they may have different forms of digestion/different predators/prey making them different from one another. |
| D | Because of species isolationism they cant reproduce because their behaviors are way too different. |

## Score Point 0

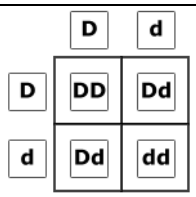
| Part | Student Response |
|---|---|
| A | Do black sea turtles tend to inhabit darker areas of the ocean? |
| B | Scientists could identify some of their habits, like eating for example. What food do they eat and how does it affect them differently? |
| C | For example, if a green sea turtle is mostly herbivouris it would live in diffferent parts of the ocean filled with ocean plants than a black sea turtle if it were to eat small crustations at the bottom of the sea bed. |
| D | If separated, some turtles could end up picking up different habits, like what food they eat, and they could even have different predators depending on where they are located from the others. |

## Item 37 Sample Student Work and Scoring Guide

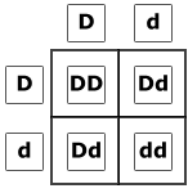
### Scoring Guide

| Score | Description |
|---|---|
| 3 | The response demonstrates a thorough understanding of Punnett squares. The response correctly completes the Punnett square for a cross between two heterozygous mice. The response correctly determines the percentage of offspring that are expected to have light-colored fur and clearly explains the answer. The response also clearly explains why the student's claim is not supported by the information provided. |
| 2 | The response demonstrates a general understanding of Punnett squares. |
| 1 | The response demonstrates a limited understanding of Punnett squares. |
| 0 | The response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured. |

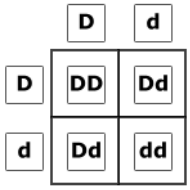
### Score Point 3

| Part | Student Response |
|---|---|
| A |  |
| B | 25% of the offspring will most likely have light fur. Since the recessive allele, "d", is light fur, there is only one offspring with the two recessive alleles. One offspring out of four is 25%. |
| C | Granite is a light rock and the genotypes DD and Dd are dominant dark fur traits. This means that the mice will have dark fur and they will be easily seen by predators. therefore, those genotypes would not increase the mice's fitness. |

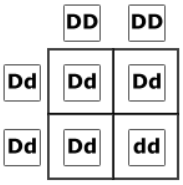
### Score Point 2

| Part | Student Response |
|---|---|
| A |  |
| B | 25% of the offsrping are expected to have light colored fur. Since light colored fur is recessive, it will only show when there is not a dominant trait present (in this case that would be when the allele is dd) and there are only a 1/4 chance that the allele will be homozygous recessive. |
| C | This is incorrect because an allele can't just change the fitness of a species, if the species did have an advantage being homozygous dominant, or heterozygous, it would have to evolve and the ones who could survive and reproduce better will create more offspring. Also the color of the fur most likely will not affect the fitness on granite rock. |

## Score Point 1

| Part | Student Response |
|---|---|
| A |  |
| B | The percentage of ligh colored mice would be 75%. |
| C | Because their is no vidence that having a certain genotype will increase or decrease your chances of surviving. |

## Score Point 0

| Part | Student Response |
|---|---|
| A |  |
| B | there's a 17 perecent that one of them will be expected to have loght colored fur because in the punnet square theres only dd one time 1 out of 6. |
| C | The students claim is not supported by the information because a basalt rock forms over a granite rock and a granite rock has more that are light colored fur. |

## Item 42 Sample Student Work and Scoring Guide

### Scoring Guide

| Score | Description |
|---|---|
| 4 | The response demonstrates a thorough understanding of the cell cycle. The response clearly describes two processes that happen to cells during the interphase stage of the cell cycle. The response also clearly explains why mitosis must occur before cytokinesis and clearly describes one way a person's body would be affected if cells did not go through mitosis and cytokinesis. |
| 3 | The response demonstrates a general understanding of the cell cycle. |
| 2 | The response demonstrates a limited understanding of the cell cycle. |
| 1 | The response demonstrates a minimal understanding of the cell cycle. |
| 0 | The response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured. |

### Score Point 4

| Part | Student Response |
|---|---|
| A | During interphase, the cell grows and prepares to start dividing, and the DNA in the cell gets replicated into an identical copy that will go to the new cell. |
| B | Mitosis must occur before cytokenesis because mitosis is when the nucleus divides and the chromosomes are seperated to both sides of the cell. If this did not happen before cytokenesis, then the cytoplasm would divide and the new cell would not have the right DNA and chromosomes to function. |
| C | A person's body would be affected if cells stopped going through mitosis and cytokenesis because the damaged or dead cells would not be able to be replaced. If cells like skin cells were damaged and did not get replaced by new cells, then the person would have damage in their skin, and be open to infections and other diseases that could penetrate the open spaces. |

### Score Point 3

| Part | Student Response |
|---|---|
| A | Durring the interphase stage, cells grow and mature until they go into mitosis. |
| B | Mitosis must occur before cytokinesis because cytokinesis is when the cell splits to form two cells and before that happens, DNA needs to be organized so both cells get the right ammount. |
| C | If cells stopped going through mitosis and cytokinesis, then a person's body would not be able to grow or heal. |

### Score Point 2

| Part | Student Response |
|---|---|
| A | The cell grows, allowing it to prepare for mitosis. The cell also develops, allowing it to changge with time before mitosis. |
| B | Mitosis rnust occur before cytokinesis because the new cells produced from mitosis must go through cytokinesis before interphase. |
| C | The person would stop growing and eventually die because the cells wouldn't be reproducing and all of their cells would eventually die without being replaced. |

## Score Point 1

| Part | Student Response |
|---|---|
| A | Two event sthat happen when the go into the interphase is Mitosis and cytokinesis. It happens after and befoe the interphase and redoes its self while it keeps going into a cycle |
| B | Mitosis occurs before cytokinesis because it is getting ready for that stage to come and has a important role to play before going into the cytokinesis |
| C | The body wouldn be able to grow anymore or get stronger because cells arent replacating itself, meaning no growing, no getting stronger, and the cells that are dying would not be able to make more of itself causing the cells to die, witch also means where slowly dying. |

## Score Point 0

| Part | Student Response |
|---|---|
| A | mitosis and cytokinesis |
| B | to store energy |
| C | they would die |