Defend That Statement!

Use the evidence you have gathered at various stations to defend the following statement:

Certain traits are more common in a population because the traits increase an individual’s probability of surviving and reproducing in its environment.

Your Task: At the end of the evidence-gathering (2 class days) you will write a paragraph that defends the above statement. This will be done in class and graded according to the rubric.

Your paragraph must include:
- an introductory sentence
- at least three pieces of evidence from the stations
- a closing statement
- source citations (direct quotes or paraphrasing is fine, but you must cite each source)

Your Checklist – You must read or view at least 3 of these sources while gathering your evidence. The article is a REQUIRED source for all students. (You may need to use your own additional paper for taking notes.)

- One Article with Questions [REQUIRED FOR ALL STUDENTS]
  (#1: When Darwin Got Sick of Feathers OR #2: A Fish that Does What?)
- Rock Pocket Mouse Video (The Making of the Fittest) – PLUS WORKSHEET (link on website)
- Online Game – Who Wants to live a Million Years? – PLUS WORKSHEET (link on website)
- Textbook Reading (p 157-159 in Life’s Structure & Function)

<table>
<thead>
<tr>
<th>Source</th>
<th>Notes/Evidence</th>
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</thead>
<tbody>
<tr>
<td>Article</td>
<td>Source: (Milius) or (Ornes)</td>
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<td>Source: (The Making of the Fittest)</td>
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<td>Source: (Who Wants to Live a Million Years)</td>
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<td>Source: (Glencoe, Page #)</td>
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</table>
Who Wants to Live a Million Years? (The Survival Game) Name ____________________

Can you help your species survive in a changing – and sometimes cruel – environment? Try this game and find out!


☐ 2. Click on “Learn About Natural Selection” and then read along and click, until you get to the button for “Play the Survival Game”.

☐ 3. Click on “Play the Survival Game”. IMPORTANT!!!
Before you choose your Starter Population, click on Hints (lower right corner) to learn the advantages (pros) and disadvantages (cons) for each trait.

☐ 4. Follow the directions. Can your species survive for a million years? (You can try again with different traits – or use mutations as life preservers to increase your chances of survival.)

☐ 5. When you have successfully survived for a million years, answer the questions below...

Question A: The term for differences in traits within a certain species is ________________.
   a) The same traits     b) Variations     c) Colors     d) None of the above

Question B: What is a process that can cause changes in a species over time?
   a) Mitosis    b) Mutation    c) Disease    d) All of the above

Question C: Which trait could be passed from parent to offspring, but might not be beneficial to species survival?
   a) Eye color    b) Long legs    c) Large Size    d) Heightened Senses

Question D: Give one advantage and one disadvantage for each variation in the chart below...

<table>
<thead>
<tr>
<th>Variation</th>
<th>Advantage</th>
<th>Disadvantage</th>
</tr>
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<tbody>
<tr>
<td>hairless</td>
<td></td>
<td></td>
</tr>
<tr>
<td>furry</td>
<td></td>
<td></td>
</tr>
<tr>
<td>long legs</td>
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</tbody>
</table>

Question E: If the climate gets colder for thousands of years, what changes might you see in a species, based on the information above?
A peacock’s tail looks gorgeous to us, and probably to the less-decorated female (in front). Yet the tail doesn’t look as if it helps a male survive, which worried Darwin for a while.

The great biologist Charles Darwin wrote to another scientist in 1860 that looking at a peacock feather made him sick to his stomach. OK, he was halfway joking (you can tell from the rest of the letter). But still, you might wonder what was wrong with the man.

He lived more than 100 years ago, but he was talking about the same kind of peacocks we know today. Peacocks, the name for males of the species, fan out tail feathers in blues and greens that are bright as jewels. Not obviously something to throw up about.

Darwin’s problem was that peacocks and some other upsetting life forms might have ruined the major work of his scientific life. Or would have if he hadn’t worked out a tough puzzle. For years, he studied pigeons, barnacles, beetles, orchids and many more kinds of creatures. He put together the ideas we know today as evolution, a theory of how all living things today are related. They came to have their current forms as they changed over many millions of years.

Bumper stickers hadn’t been invented in Darwin’s day (to be fair, neither had cars). Otherwise he might have ridden around England with “SURVIVAL OF THE FITTEST” between his taillights. That notion of survival of the fittest was a huge part of his ideas of how evolution worked. In any kind of animal, plant or whatever, there’s variety among individuals, he pointed out. Some mice run faster than other mice. Some hawks have better eyesight. Some raspberry bushes make more berries.

Those individuals best suited to survive in their particular home range will have more offspring than those that are less well suited. The best-suited survivors can pass along the speed or eyesight or other trait that made them especially successful at surviving. Over generations, those useful traits would...
become more common for that kind of creature than the less useful traits. Darwin called this process natural selection.

Now for the sickening part about peacocks. Those fancy tails making the bird more fit to survive — he thought that just didn’t make sense! A peacock tail can stand five feet high. All those huge feathers make flying harder, not easier. Even sprinting along the ground becomes difficult.

Peacocks don’t need all those feathers for finding food. The peahens, the name for females of the species, do just fine with small tails. Females have plainer colors too, so it’s hard to see how huge, jewel-colored tails could be so important for survival in the males of the species.

Other kinds of creatures raised the same upsetting problem. Darwin wrote about big, heavy horns on male beetles or on male deer, called stags. (Dung beetles don’t need horns to spend their lives collecting poop. It’s not going to fight back.) Darwin figured it out though. These fancy bird feathers and animal horns often do not give a creature direct help in surviving. What they do is help with finding a mate.

A bird with the most beautiful tail ends up as the father of lots of children, and he can pass along his beauty. Over generations this kind of bird’s tail gets fancier. Or, for another example, male dung beetles use their horns to fight each other, and the winner gets the girl. Over generations that kind of beetle’s horn gets more effective.

3. The peacock tail can stand five feet tall. Why would this be a disadvantage?

4. What advantage do the tail feathers give the male peacock?

5. Beneficial traits are passed on from generation to generation. Explain why the peacock’s tail has become fancier over several generations.
Life is anything but a vacation for a climbing goby, a small fish that lives in Hawaii. Usually shorter than your thumb, this fish hatches in freshwater high in the hills and mountains. But soon afterward it’s swept out to the salty sea by strong currents.

About six months later, the fish begin the long journey back upstream to freshwater above waterfalls. It’s a good place for climbing gobies to breed because their natural predators — mainly other fish — can’t get to them above the falls.

During its return to the high freshwater streams, a climbing goby faces two deadly challenges. First, the fish has to swim through lowland waterways that are filled with predators — larger fish that are looking for a goby snack. Then, a goby has to climb up rocky waterfalls, some of which are hundreds of feet tall. It clings to the slippery rocks with its mouth and a tiny sucker on its underside. Slowly, inch by inch, the fish climbs. Richard Blob, a scientist at Clemson University who studies gobies, says that “in human terms, it’s like a marathon.”

Gobies of the same species have differently shaped bodies depending on where they live in the Hawaiian islands. Fish in some places are short and squat; others are taller from top to bottom. Blob and a team of scientists recently studied the bodies of climbing gobies to try to understand why this variation in body shape exists.

Blob and his team placed climbing gobies from Hawaii’s Big Island in tanks containing sleeper fish, which prey on gobies. After the sleepers had caught half the gobies, the scientists measured the bodies of the surviving gobies. Those that were able to escape being eaten were taller than average. A taller body allows the fish to swim faster — and thus avoid becoming a sleeper’s dinner.

If more tall-bodied gobies in a fish population survive, then their offspring will probably be tall as well. Thus, the gobies in that area will tend to be tall. But the story is more complicated.

While having a taller body may help a goby avoid predators, it may be a big problem when the fish tries to start climbing. In an earlier study, scientists found that larger gobies struggle more than smaller gobies when trying to make it up a waterfall. Shorter, squatter gobies have an easier time clinging to the rocks and not
get washed away. So, scientists wonder, is it better to have a squat body (to get up the waterfall easier), or a large body (to avoid predators on the way to the waterfall)?

**The answer is:** It depends on where a climbing goby lives. On the Big Island of Hawaii, where the waterfalls are close to the shore, gobies don’t have to travel far through predator-infested waters. So scientists can expect to find smaller gobies there. But on the island of Kauai, the waterfalls are farther from shore — suggesting that scientists will find more of the larger and faster gobies there.

The story of the goby’s body shape is an example of evolution at work. Evolution is a process taking place in every organism, from gobies to humans. It explains how species change over a long period of time. What the scientists found is that natural selection, one of the basic parts of evolution, is helping to shape the gobies’ different body sizes according to where they live. In natural selection, animals with traits that help them live in their environment will survive and reproduce more than animals with less helpful traits. So in Hawaii, the type of goby you find depends on which island you’re studying.

1. As the climbing goby fish returns to the high freshwater streams, what are the two deadly challenges it must face?
   
   -
   -

2. There are variations in the body shapes of the goby fish. Fill in the chart below to state the 2 body shapes and list their advantages and disadvantages.

<table>
<thead>
<tr>
<th>Body Shape</th>
<th>Advantage</th>
<th>Disadvantage</th>
</tr>
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<tbody>
<tr>
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</table>

3. On which island would you expect to find the short and squat gobies?
   
   3b. Why is this?

4. On which island would you expect to find the tall-bodied gobies?
   
   4b. Why is this?

5. Explain why scientists find variations in goby fish on the islands of Hawaii:
1. Define Mutation: ________________________________

2. Is the following statement true or false? The appearance of dark colored volcanic rock caused the mutation for black fur to appear in the Rock Pocket Mouse population.
   
   TRUE or FALSE

*Justify your answer using one or two sentences.
   ______________________________________________________________
   ______________________________________________________________
   ______________________________________________________________

3. The graph below shows the Rock Pocket Mouse population over several years. Use the graph to answer the following questions.

4. What was the dark mouse population in 2008? ________

5. In one or two sentences, summarize the data in the graph. ___________________

   ______________________________________________________________
   ______________________________________________________________
   ______________________________________________________________

6. Develop a possible explanation to support this data. ___________________

   ______________________________________________________________
   ______________________________________________________________
<table>
<thead>
<tr>
<th></th>
<th>Exceeds Standards</th>
<th>Meets Standards</th>
<th>Working Towards Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Quantity of Evidence</strong></td>
<td>3 or more pieces of evidence were used.</td>
<td>2 pieces of evidence were used.</td>
<td>Fewer than 2 pieces of evidence from the articles were used.</td>
</tr>
<tr>
<td><strong>Quality of Evidence</strong></td>
<td>Evidence is detailed and provides a scientific explanation.</td>
<td>Evidence is pulled from the article but it needs more details.</td>
<td>Evidence was not supported by the article, or evidence was too general.</td>
</tr>
<tr>
<td><strong>Writing Conventions</strong></td>
<td>1-2 errors in spelling, grammar, sentence structure. Errors do not impact readability.</td>
<td>Several errors in spelling, grammar, sentence structure. Errors do not impact readability.</td>
<td>Many errors in spelling, grammar and sentence structure. Errors negatively affect readability.</td>
</tr>
<tr>
<td>All Sources Cited Properly</td>
<td>Yes</td>
<td>No</td>
<td>1</td>
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<tr>
<td>Intro Sentence Included</td>
<td>Yes</td>
<td>No</td>
<td>1</td>
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<tr>
<td>Closing Statement Included</td>
<td>Yes</td>
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**Total Score ___ / 12**