**Stage 2 Biology**

**Evolution – Formative Test Answer Guide**

**Section A: Multiple-Choice Questions**

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| --- | --- | --- | --- | --- | --- |
| 1. | **M** | 2. | **K** | 3. | **J** |
| 4. | **K** | 5. | **K** | 6. | **M** |
| 7. | **K** | 8. | **L** | 9. | **J** |

**Section B: Short Answer**

1(a)

Gene pool

1(b)

Some genetic variation was present or became present with mutation that gave fish ability to survive at lower temperatures. Selection pressure was present and those who had the favorable characteristics were able to survive at lower temperatures as the temperature lowered over time.

1(c)

Describe either DNA sequencing; amino acid sequencing in proteins; or rRNA sequencing

1(d)

At some point in time the two populations were likely linked together. There was a bottleneck event that separated the population in Lake B from the population in Lake A. Because there were only a few of the original population able to colonize Lake B there was only a small percentage of the total gene pool that was in the original population. This mean that Lake B population has a smaller genetic diversity (lacking as many allele variations).

2(a)

Either:

* Increasing competition for food resources causes a decline in the birds
* Increasing competition for nesting sites, shelter, or other resources
* The introduced animals bring with them diseases/parasites that the birds are not immune to and therefore are affected negatively by.
* Etc.

2(b)

Island M is in a more advanced state of succession. The evidence of this is that it is currently supporting more intermediate and climax species (ie. trees). Island L also has a lot of rocky outcrops still exposed suggesting that succession is still in the early stages as soil has not developed in these areas yet.

2(c)

Any of the following could be reasons why the birds being established on M will be less susceptible to speciation:

* There is no competition with other birds on M whereas there is on L; this means they are less likely to be forced into different feeding habits and there will be less selection pressure in this way on M
* They will be in habitat more closely resembling the mainland where they come from (esp. tree presence); this means less selection pressure to adapt to new habitat conditions

2(d)

The founder effect is what happens when you take a small portion of an original (ancestor) population and separate it to form a new colony. The new colony, made up of only a small portion of the original, will have a much lower genetic biodiversity (less allele variations). This will lead to extensive inbreeding and make the new population more susceptible to being negatively affected from disease and other selection pressures that may come.

2(e)

The gene flow would be reduced between birds of this species. The gene flow may be present but minimized between the mainland population and Island L population, because it is only 4km offshore and members may be able to fly between the two populations and interbreed. However, the gene flow between the mainland population and Island M population may be non-existent as they are separated by 19km. It is likely that the birds will not interbreed and so will not share the same gene pool. *\*allopatric*

3

Examples you could choose are:

* Polar bear affected by declining sea ice; harder to get prey
* Walruses affected by declining sea ice; nowhere to rest/raise young
* Specific trees or flowers blooming earlier due to warmer weather; affects migratory birds and other animals who depend on them
* Changes to ocean current patters and temperatures; affects whales and other fish that depend on food sources associated with these
* Permafrost melting in polar regions; affects trees/plants that live there as frozen soil turns to mud and is lost in runoff
* Etc.

4(a)

A declining population and therefore gene pool caused by:

* Road kill
* Trapping/killing by European settlers
* Other possible bottleneck events

4(b)

The lower diversity may mean that selection pressures will have a greater and more negative affect on the population. This is because they are less able to adapt and so natural selection may actually wipe them out when they face selection pressures they are not able to cope with.

**Section C: Extended Response**

For this question you need to be clear on the three key categories of biodiversity: genetic, species, and habitat/ecological. You need to discuss, using examples, how increasing human population has put stress on and affected these three types for the worse. For example

Genetic

- poaching has led to great reduction in certain populations of animals (cheetahs, rhinos, etc.) and so greatly reducing the genetic variation of alleles in gene pools

- numerous examples of bottleneck events that have happened – Islandization; agriculture – clearing forests and placing single species in their place

Species

- overharvesting fish species to the point of extinction in order to feed the population

- destroying habitat for farming and cities; reduces number of species in areas

- introducing species that kill out native ones completely

Habitat/Ecological

- destroying whole habitats like coral reefs;

- pollution of ocean and other water habitats

- clearing rainforests

Finally, you should explain the benefits of maintaining an earth that has high biodiversity. For example:

* It increases overall ecosystem productivity; this allows for more sustainable resources for the planet
* Adds to climate stability globally
* Gives earth more resilience to negative events and impacts; if all earth is the same we are more prone to problems affecting everyone/everywhere
* Better soil for us to use
* Provides for better nutrient recycling
* We preserve the beauty of earth, which we all enjoy