

Assessing assessments

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Exam subject: Living Environment	Pages - questions: Questions 47-49, page 16
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Analysis and considerations:

Icefish Evolution

Over the last 50 million years, icefish evolved many adaptations that contributed to their success in surviving the decreasing water temperatures of the ocean surrounding Antarctica. For example, they have the ability to produce an antifreeze protein that prevents their blood from freezing in waters that are now below the normal freezing point of fresh water.

Note: The answer to question 47 should be recorded on your separate answer sheet.

- 47 Scientists have analyzed the icefish DNA and documented genetic changes that gave rise to the antifreeze gene. Their findings are represented in the diagram below.



Process X is referred to as

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|--------------|---------------------|
| (1) mitosis | (3) differentiation |
| (2) mutation | (4) meiosis |

- 48 Explain how the process of natural selection can account for the increase in frequency of the antifreeze protein gene in the icefish population. [1]

Note: The answer to question 49 should be recorded on your separate answer sheet.

- 49 In addition to the appearance of the antifreeze gene, icefish have also been found to have DNA sequence similar to the DNA sequences in hemoglobin genes of other fish species. However, these DNA sequences are not complete and therefore not functional in icefish. This evidence makes it likely that

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| (1) icefish ancestors had hemoglobin |
| (2) icefish will soon produce offspring with hemoglobin |
| (3) hemoglobin is a molecule made by some fish that do not have genes for it |
| (4) soon all fish will stop producing hemoglobin |

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- Essential Background Knowledge:
 - It would help to know the basic anatomy and physiology of a fish
 - It would help to know what it means for a species to evolve
 - Knowledge of the term “natural selection” is essential to answering question 48
 - Knowledge of DNA’s function is necessary for question 49

- In terms of vocabulary, students will have an easier time answering these questions if they know the words:
 - ancestor, offspring, molecule, mitosis, mutation, differentiation, meiosis, frequency, genes
- Validity for ELs
 - Construct Validity-does the test measure what it claims to be measuring?
 - We believe that this test does a pretty good job of measuring how well a student knows living environment. All of the terms that are used in the test, besides the word fish perhaps, seem to be words that are brought up in a living environment class, so this test isn't testing whether or not the student knows the English language, but rather is testing their summative knowledge of living environment.
 - Content Validity-does the assessment represent all facets of the tasks within the domain being assessed?
 - This question incorporates *some* knowledge across multiple areas of biological knowledge; it incorporates genetics, evolution, adaptability, and a small degree of body systems.
 - While this question touches on multiple domains, it does not delve into all components of the domains being tested (i.e. neglects artificial selection, the role of hemoglobin, etc.)
 - Predictive Validity-does the score on this assessment predict future performance?
 - This test doesn't have great predictive validity because it doesn't necessarily build on other concepts they need. This test as a whole doesn't seem to do a good job of building on concepts that students may need in real life.
- Strategies and Considerations to help ELs demonstrate their knowledge regardless of their language proficiency
 - Add a box of "key terms" that are required to understand the question, but are not being tested in this particular question.
 - Use visuals to supplement the scenario that is described; this question is rather wordy, and can therefore be supplemented with a diagram(s) to help ELLs understand what they are being asked.