

### Sample Constructed Response questions from the 2007 Science OGT

1. A university student wants to perform an experiment using mice as test subjects. The procedure would require the mice to be injected with a specific bacterial infection and then treated with an antibiotic. Their response to the treatment would be observed and recorded. Provide two questions that an ethics review board would raise regarding the proposed work. For each question, explain why it is important that the question be answered prior to granting permission for the experiment. Respond in the space provided below. (4 points)

2. Scientists have written computer programs to model populations of organisms within ecosystems. By changing initial numbers of individuals and survival rates, these programs can simulate what will happen to members of the ecosystem over time.

Explain how computer modeling could be valuable to an ecologist studying a forest ecosystem. Speculate on why this type of data can only be gained by using a computer program. Respond in the space provided below. (2 points)

3. Some strains of laboratory mice have been inbred for many generations, resulting in large numbers of mice with nearly identical genetic makeup. Explain an advantage of using these mice in designing an experiment to test the effects of a new drug. Compare this to a test using mice with varied genetic makeup. Respond in the space provided below. (2 points)

### **Constructed Response tips:**

- Take note of how many points the question is worth. You will need to state one idea for each point.
- Either divide your answer space into 2 or 4 blocks, or draw 2 or 4 bullet points before you even start writing your answers. This will help you keep your ideas organized.
- If there are words you don't know and you're allowed to use a dictionary, mark them (underline, circle, etc.) and look them up before answering.
- Carefully read the question to determine what you are supposed to do.
- Make sure that your answers are *specific* and do more than restate information from the question.

### **1. Mouse experiment.**

Some possible responses... Each response must pose a question (1 pt) and explain why the question is important (1 pt). Two question/explanation responses are required to earn the full 4 points.

- What is the potential for the bacteria being used to cause harm to the mice or result in death? It is important that the mice not suffer needlessly.
- Will the mice be quarantined? To prevent spread of the infection to other laboratory animals not involved in the experiment.
- What are the potential side-effects of the antibiotic being used? (or are the potential side-effects of the antibiotic known?) The side-effects could be worse than the infection or cause needless suffering.
- How will the mice be treated throughout the experiment? To verify proper care and feeding of the mice.
- What will happen to the mice after the experiment is completed? To establish that the mice are treated humanely and not disposed of carelessly or are disposed of humanely.
- How many mice will be required for the experiment? To make sure that the student did not use too few mice to accurately determine the effects of the treatment or so many as to cause unnecessary exposure and suffering.
- What is the hypothesis for this experiment? To determine a valid purpose for the experiment.

There are other acceptable responses as well!!! These are just a few ideas!

## 2. Simulation of animal populations.

To receive full credit, a response must explain how the computer model could be valuable (1 pt) and also speculate why this data can only be gained with a computer (1 pt).

Possible responses...

- An ecologist might be able to gain information about how forest populations could change in response to the extinction or reduction in population of one member of the ecosystem.
- Evidence gathered from computer modeling could be used to seek protection for an organism if its removal could be shown to disrupt the ecosystem.

AND

- The simulation allows the scientist to manipulate variables that she has no control over in the real ecosystem.
- The simulation allows her to try out different scenarios that could only be examined by the computer program without doing damage to the actual environment.

## 3. Using genetically similar mice.

This question requires you to state an advantage of using similar mice (1 pt) and also compare this to an experiment using more varied mice (1 pt).

There are always many possible correct answers to a Constructed Response question, but most answers to this question will be similar to this:

- Using genetically similar mice would allow scientists to test the drug on nearly the "same" mouse many times or in different ways (dosage, with or without food, once a day vs. many times, etc.).
- Using mice that are not genetically similar could result in a variation of the drug's effectiveness, making it more difficult to study.