AP BIOLOGY MIDTERM EXAM FREE-RESPONSE QUESTIONS <u>PRACTICE</u>

Directions: Question 1 is a long-response that should require about 22 minutes to answer and is worth 10 points. Question 2 is a short free-response question that should require 6 minutes to answer and is worth 4 points. Read the questions carefully and completely. Write your responses on a piece of paper. All questions must be written out in paragraph form. Outline form is not acceptable. Labeled diagrams may be used to supplement discussion, but unless specifically called for by the question, a diagram alone will not receive credit.

1. In an investigation of pill bug behavior, a covered choice chamber is used to test whether the spatial distribution of pill bugs is affected by the presence of a substance placed at one end of the chamber. To tests the pill bugs' preference for sucrose, 60 pill bugs are introduced into the middle of the choice chamber. A quarter sized mound of soil is soaked with 20% sucrose solution is placed at one end of the chamber and a dry quarter sized mound of soil with no solution is placed at the other end. The positions of the pill bugs are observed and recorded every minute for 10 minutes.

   a. **Predict** the distribution of flies in the chamber after 10 minutes and **justify** your prediction.
   b. **Propose** ONE specific improvement to each of the following parts of the experimental design and explain how the modification will affect the experiment.
      i. Experimental control
      ii. Environmental factors
   c. The experiment described above is repeated with ripe peaches at one end and unripe peaches at the other end. Once again the positions of the pill bugs are observed and recorded every minute for 10 minutes the positions of pill bugs after 1 minute and after 10 minutes are shown in the table below.

Distribution of Pill Bugs in Choice Chamber

Time (minutes)	Position in Chamber		
	End with Ripe Peach	Middle	End with Unripe Peach
1	21	18	21
10	50	3	7

   Perform a chi-square test on the data for the 10-minute time point in the peach experiment. **Specify** the null hypothesis that you are testing and enter the values from your calculations in the table below.

   d. **Explain** whether your hypothesis is supported by the chi-square test and justify your explanation.
   e. Briefly **propose** a model that describes how environmental cues affect the behavior of the pill bugs in the choice chamber.

PART (C): CHI-SQUARE CALCULATION

Null Hypothesis:			
	Observed (o)	Expected (e)	$(o-e)^2/e$
End with ripe			
Middle			
End with unripe			
Total			

2. Fossils of amniotes and reptiliomorph amphibians, which are ancestors of reptiles, are found in rocks that are at least 320 million years old. Fossils of the oldest reptile-like vertebrate animals with reptilian toes, imprints of scales, and numerous sharp teeth are found in rocks that are approximately 315 million years old.

   Three samples of rocks are available that might contain fossils of transitional species between reptiliomorph amphibians and reptiles: one rock sample that is 318 million years old, one that is 310 million years old, and one that is 330 million years old.

   a. **Select** the most appropriate sample of rocks in which to search for transitional species between lobe-finned fishes and amphibians. **Justify** your selection.
   b. Describe **TWO** pieces of evidence provided by fossils of transitional species that would support a hypothesis that reptiles evolved from amniotes and repiliomorph amphibians.