

You are free to consult any books or written materials. You are not to discuss the examination with any other persons, until you have handed in your answer.

Suggestion: review the various procedures *we have studied during the course* and consider their usefulness. Employ various of them to address the problem below. Be sure to include pertinent graphs and figures.

Your answer is to be submitted to me by *11:15 am Thursday 9 December*. I will be at the classroom, but you can slide your report under my office door (417 Evans). Have some fun with it.

**A Toxicological Experiment.** An experiment was carried out by entomologists to investigate the joint effects of an enzyme (*chitinase*) and a biological pathogen (nucleopolyhedrosis virus) on the Gypsy Moth, as expressed by increased mortality in treated larvae. Concerning the biological mechanism involved, it has been suggested that the enzyme might disrupt the lining of the insect's gut thereby allowing greater amounts of the virus to enter the damaged membrane and infect susceptible cells. The scientists wondered, for example, if the activity of the pathogen was enhanced by the addition of the enzyme.

Briefly, experiments were performed wherein second-instar (1 week old) gypsy moth larvae were placed in containers, of 30 larvae, and then exposed through their diet to various concentrations of the virus and the enzyme. There were four levels of the virus (.5, 5, 50, 500)*pib/mm*<sup>2</sup> and five different levels of the enzyme (0, .001, .01, .1, 1%). All tests were replicated five times. Numbers of deaths were tallied after two weeks. [*pib* refers to polyhedral inclusion body].

The data may be found on the class website as a matrix. The rows correspond to containers. The first column of the matrix is the replicate label, the second the virus level label (increasing with level), the third the chitinase level label (increasing with level) and the fourth the number of larvae of the container that were dead at the end of the second week.

Carry out a detailed analysis of the effects of the enzyme and virus on the mortality of the gypsy moth larvae and prepare a scientific report presenting your work and conclusions.

The first 8 rows of the data set are:

1 1 1 0  
 2 1 1 0  
 3 1 1 0  
 4 1 1 0  
 5 1 1 0  
 1 2 1 0  
 2 2 1 0  
 3 2 1 8  
 4 2 1 4