1. Several things happened which helped humankind develop technology, science and culture. What were they? Please comment on their contribution. (10 points)

2. What is a Land Grant College/University? (15 points)

3. Biological Compliance has become an increasingly important aspect of research with biological organisms. Please outline and comment on the general procedures which should be considered in the Implementation of Compliance (15 points)

4. According to Gopen and Swan there are structural principles that will make scientific writing significantly more comprehensible. What are they? (6 points)

5. Define or describe 5 of the 7 items: (3 points each totaling 15 points)
   - First Hatch Act:
   - Science:
   - Quality Assurance Unit:
   - Containment facility:
   - Plant Pest (PPQ definition)?
   - GLP
   - MSDS

6. (Total of 6 points)
   - (a) How would you define Information Technology? (1 point)
   - (b) It has been said that “Science and technology function synergistically in a positive feedback to produce new knowledge.” What do you understand by this statement? (1 point)
   - (c) Briefly describe the structure of the Internet and how data are transmitted over the Internet (4 points).
7. (Total of 10 points)

(a) What are the basic steps that one should follow when carrying out a statistical experiment? (2 points)

(b) Describe (with examples) the 4 main types of data (response variables) that can be collected in a statistical experiment. What is (are) the most appropriate statistic(s) for describing each of the response variables? (2 points)

(c) How would you explain to someone the difference between the factor and the response variable in an experiment? (1 point)

(d) What is the general ‘rule of thumb’ for selecting the best statistical analysis for the data you collect? (1 point)

(e) “Statistical studies can be prospective or retrospective.” What do you understand by these terms? (1 point)

(f) What is Exploratory Data Analysis (EDA)? What are the two basic principles of EDA? How does EDA differ from statistical analysis? (3 points)

8. (Total of 12 points)

(a) You are planning an experiment that has the following objective:

To determine the breaking strength (kg) of thin, medium, heavy, and extra heavy rubber seals, which either are were not treated or treated either by wetting, wetting 15 minutes before stretching, rubbed with petroleum jelly, rubbed with petroleum jelly 15 minutes before stretching, rubbed with shaving cream, rubbed with shaving cream 15 minutes before stretching, soaked in lubrication ointment, soaked in lubrication ointment 15 minutes before stretching, exposed to saliva, or exposed to saliva 15 minutes before stretching.

What are the statistical components in this experiment? For each experimental factor, indicate whether it is quantitative or qualitative. Also indicate the type of response variable(s) you will collect, the statistic(s) that will be used to describe the response variable(s), and the factorial scale of the experiment (6 points).
You were asked to design an experiment

To determine the growth rate (cm/day) and rate of spread (m²/week) of four turfgrass species (short fescue, tall fescue, Kentucky blue grass, Bermuda grass), which are watered either by flood irrigation or overhead irrigation applied once or twice per week, receive one of four types of fertilizers, and are treated with a pesticide combination either once or twice during the 10 week period of the study.

(b) You are asked to restate the objective of this study using the standard form that was discussed in class (1 point)

(c) Outline the main statistical components of the study? For each experimental factor, indicate whether it is quantitative or qualitative. Also, indicate the type of response variable(s) you will be collecting and the statistic that you will use to describe the response variable(s). What is the factorial scale of this experiment? (4 points).

(d) What might be an extraneous factor in the study? How would you control for the extraneous factor in your experimental design? (1 point)
9. (Total of 11 points)

(a) Describe briefly how GPS works (2 points)

(b) What is a Geographic Information System (GIS)? (1 point)

(c) The figure below shows the main components of a GIS. Describe (by labeling the arrows) each of the components in a GIS (8 points).