1. Discuss some of the technical problems which are becoming major issues and concerns associated with electronic archiving (6 points)

2. What is the purpose and role of the hypothesis (testing) in scientific research? (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. Briefly discuss/outline the writing sequence that one might follow in producing a scientific publication (6 points)

5. Define or describe 6 of the 8 items: (3 points each totaling 18 points)

   Smith-Lever Act:
   Papyrus:
   Quality Assurance Unit:
   Descriptive vs. Normative Science:
   Plant Pest (PPQ definition):
   Stress vs Topic Position:
   MSDS:
   IMRAD:

6. (Total of 6 points)
(a) How would you define Information Technology (IT)? (1 point)
(b) “Information Technology is a Cognitive Tool.” What does this mean? (1 point).
(c) What is the Internet? How is the Client-Server model relevant to the Internet? (2 points).
(d) The Internet uses a set of communication standards (transfer protocols) to transmit data. Using an example of a transfer protocol, describe how data are transmitted over the Internet. (2 points)

7. (Total of 10 points)
(a) What are the basic steps that one should follow when carrying out a statistical study? (2 points)

(b) Outline the 4 main types of data (response variables) that can be collected in a statistical study. What is (are) the most appropriate statistic(s) for describing each type of response variable? (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 (response variable) you collect? (1 point)

(e) “Statistical studies can be experimental or observational.” How would you distinguish between these two types of studies? (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 that are not treated or treated either as follows: wetted, wetted 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.

You are asked to: (4 points)
- Outline the statistical components of the experiment
- For each factor, state whether it is quantitative or qualitative.
- Indicate the type of response variable(s), the statistic(s) that describe(s) each response variable, and the factorial scale of the experiment.
A veterinary student asked for your help in designing her research study. She would like to determine the arterial pressure, pulmonary artery pressure, and cardiac output in dogs exposed to different modes of ventilation (control, zero expiratory pressure, positive expiratory pressure) and vaso dilation drugs (A, B, C, D).

You are asked to:

i. Help the student write the objective of her study using the standard form of the objective statement that was discussed in class (1 point).

ii. Help her (3 points):
   - Outline the main statistical components of the study.
   - Tell her whether the study experimental or observational?
   - Tell her whether each factor is quantitative or qualitative.
   - Let her know the type of response variable(s) she will be collecting and the statistic(s) that can be used to describe each response variable.
   - Show her the factorial scale of the experiment?

iii. Suppose the student decided that male and female dogs might respond differently and wants to include the effects of gender into the study (2 points).
   - What is the factorial scale of the study with gender included?
   - Does the inclusion of gender make the study experimental or observational?

iv. Gender is obviously an extraneous factor in the original study. What might be another extraneous factor in the study? How would you assist the student in controlling for the extraneous factor that you have identified? (2 points).
9.)
(a) Define remote sensing (1 point)

(b) What is a map coordinate system? Give two examples of map coordinate systems (2 points)

(c) Describe briefly how GPS works. What are two sources of errors in GPS readings? (2 points)

(d) Define Geographic Information System (GIS) and describe (by labeling the arrows) each of the main components of a GIS (7 points).