1. A corporation found that technology trainings were often stressful to their employees. One idea was to play background music (jazz or classical). Another idea was to have the presenter and participants dress casual rather than the usual business attire. Equivalent technology trainings over the next year were randomly assigned a particular condition. A post training survey was given to measure the stress associated with each training.

(a) Name the factors.

(b) Name the treatments.

2. When a tractor pulls a plow through an agricultural field, the energy needed to pull that plow is called the draft. The draft is affected by environmental conditions such as soil type, terrain, and moisture.

A study was conducted to determine whether a newly developed hitch would be able to reduce draft compared to the standard hitch. (A hitch is used to connect the plow to the tractor.) Two large plots of land were used in this study. It was randomly determined which plot was to be plowed using the standard hitch. As the tractor plowed that plot, a measurement device on the tractor automatically recorded the draft at 25 randomly selected points in the plot.

After the plot was plowed, the hitch was changed from the standard one to the new one, a process that takes a substantial amount of time. Then the second plot was plowed using the new hitch. Twenty-five measurements of draft were also recorded at randomly selected points in this plot.

(a) What was the response variable in this study?

(b) Identify the treatments.

(c) What were the experimental units?

(d) Given that the goal of the study is to determine whether a newly developed hitch reduces draft compared to the standard hitch, was randomization used properly in this study? Justify your answer.

(e) Was replication used properly in this study? Justify your answer.
Determine which type of experiment is applicable (completely randomized, blocked, matched pairs) and describe the experiment.

3. We wish to determine whether or not a new type of fertilizer is more effective than the type currently in use. Researchers have subdivided a 20-acre farm into twenty 1-acre plots. Wheat will be planted on the farm.

4. Two toothpastes are being studied for effectiveness in reducing the number of cavities in children. Many studies indicate diet can affect the number of cavities. Assume are 100 children available for the study.

5. An apple juice manufacturer has developed a new product – a liquid concentrate that, when mixed with water, produces one liter of apple juice. The manufacturer wants to see how potential customers will rate the liquid concentrate compared to their bottled apple juice.

6. It is common in nutritional studies to compare diets by feeding them to newly weaned males rats and measuring the weight gained by the rats over a 28-day period. 30 such rats are available and two diets are to be compared.

7. A family living in the hill country outside of Austin wants to determine which of two types of bird food will last the longest when used to fill the 6 bird feeders in their enormous backyard.
8. A new type of fish food has become available for salmon raised on fish farms. Your task is to design an experiment to compare the weight gain of salmon raised over a six-month period on the new and the old types of food. The salmon you will use for this experiment have already been randomly placed in eight large tanks in a room that has a considerable temperature discrepancy. Specifically, tanks on the north side of the room tend to be much colder than those on the south side. The arrangement of tanks is shown in the diagram.

Describe a design for this experiment that takes account of the temperature discrepancy.