Exercise 1: Drug X Study

Data Table 1: Respiration and Observations

Hypothesis	If 20 mg dosage of Drug X is effective at treating blurred vision in multiple sclerosis patients, then patients will experience more than a 30% reduction in blurred vision.
Independent Variable	Drug X dosage
Dependent Variable	Vision clarity (reduction in blurred vision)
Control	Group of patients receive placebo

Question 1

Were all seven steps of the scientific method referenced in the Drug X report summary in this exercise? Explain your answer by correlating each step to information provided in the report summary.

Yes, all steps are referenced:

1. *Observation - Multiple sclerosis patients suffer from blurry vision.*
2. *Question and research - Drug X is effective at reducing blurry vision in healthy patients. Is drug X effective at reducing blurry vision in multiple sclerosis patients?*
3. *Formulate a hypothesis - Researchers predicted that a 20 mg dose of the drug would be effective for treating blurred vision in multiple sclerosis patients by reducing blurred vision by more than 30%.*
4. *Test hypothesis - Drug X was administered to groups of multiple sclerosis patients at three doses (10 mg/day, 20 mg/day, 30 mg/day) for three weeks. A fourth group of patients was given a placebo containing no Drug X for the same length of time. Vision clarity was measured for each patient before and after the three-week period using a standard vision test.*
5. *Analyze data and draw conclusions - The results were analyzed and graphed (see Figure 2), illustrating that more patients receiving 20 mg/day of Drug X per day exhibited a higher reduction in blurred vision than did the other groups. Researchers concluded that a 20 mg dosage of Drug X was effective for treating blurred vision in patients with multiple sclerosis.*

6. *Peer review verification - The researchers then submitted their work to a medical journal where it was reviewed by a panel of vision and multiple sclerosis experts.*
7. *Communicate results - The research results were published in a medical journal.*

Question 2

Was the reported study data in this exercise qualitative or quantitative? Explain your answer by referencing the definitions of each data type.

The data produced and analyzed in the study was quantitative because it consisted of numeric values that were derived from vision test measurements and computations of blurry vision reduction percentage. Qualitative data is observation-based rather than numeric.

Exercise 2: Applying the Scientific Method

Panel 1: Irrigation Study

Question: What is the optimal amount of irrigation per day for crop yield of soybean plants?

Research findings: The amount of water in inches that soybean plants need varies during plant growth: seeding - 0.1 in; growth - 0.2 in; flowering - 0.3 in; mature - 0.2 in. An average reported amount is 0.25 inches.

Hypothesis: If plants receive at least 0.3 inches of water, they will produce optimal crop yield. (Student answers may vary within reason.)

Design: Students should create a study design by which they would apply varying volumes of daily irrigation to the plants with treatments of 0.0, 0.2, 0.3, 0.4, 0.5 inches per day. The yield of each treatment group will be measured at the end of the experiment.

Panel 2: Weight Loss Drug

Question: Is the weight-loss drug most effective in overweight individuals?

Research findings: BMI categories: Very Severely Underweight, Severely Underweight, Underweight, Normal, Overweight, Obese Class I, Obese Class II, Obese Class III

Hypothesis: If the weight-loss drug is most effective in overweight individuals, they will safely lose the most weight of any BMI category. (Student answers may vary within reason.)

Design: Students should create a study design by which they would test the weight loss drug on groups of individuals in each of the BMI categories Normal, Overweight, Obese Class I, Obese Class II, and Obese Class III. Students should measure the weight of individuals before and after the trial.

Question 1

What is the purpose of a control group in an experiment? What would the control groups be for each of your designed experiments in this exercise?

A control group is not exposed to the experimental treatment (independent variable) being tested. For most experiments, a control group is necessary to compare the results of the experiment. In the soybean crop experiment, the plants receiving levels of water other than 0.5"/day would be the control groups. In the weight loss study, the individuals taking the drug who are not obese would be the control group.

Question 2

Describe the data that would be recorded in each of the experiments you designed. Would it be classified as quantitative or qualitative data?

The data recorded in the soybean study would be the mass of beans produced per plant. The data recorded in the weight loss drug study would be body weight. Both studies would produce measurements that would be classified as quantitative data.

Extension Question

Luke recently moved to a new apartment and wants to grow houseplants but isn't sure which room will be the best fit for them. Apply your knowledge of the scientific method to recommend a strategy for Luke to follow when determining the ideal location for houseplants in his new apartment?

Luke should begin by performing research on the needs of various houseplants and determine which type of houseplants might be best suited to his apartment.

He should then form a hypothesis based on his research that a specific plant will do best in a specific location in his apartment.

He would test his hypothesis by acquiring several individual plants of that type which are potted in identical containers with identical soil.

Luke would then place each plant in a unique location in his apartment, with one plant being located in the spot that he predicted would be ideal.

Luke would then maintain the plants identically over the study period and observe each for growth and overall health.

At the end of the study period, he should compare the growth and health of each individual to determine if his hypothesis was correct and to ultimately determine which location in his apartment is ideal for the selected houseplant.