

Study Guide — BI Problem 2: Human Physiology (Pretest / Diagnostic Preview)

Biomedical Innovations · Problem 2 — Human Physiology · Modeled on the PLTW Guided Review format

Vocabulary to know cold

Term	Definition
Independent variable	The one factor the experimenter purposely changes (e.g., type of drink, exercise intensity).
Dependent variable	The factor that is measured as the response to the independent variable (e.g., heart rate, recovery time).
Constant (controlled variable)	A factor kept the same for every group so it does not confound the results.
Control group	The group that receives no treatment (or a standard treatment) and serves as the baseline for comparison.
Sample size	The number of subjects in a study; larger samples better represent the population.
Replication	Repeating measurements or trials to improve reliability and detect error.
Bias	A systematic error that skews results, such as choosing an unrepresentative sample.
Sharps container	A puncture-resistant container for disposing of lancets, needles, and other sharps.
Specimen labeling	Marking each sample with subject ID and collection info at the point of collection to prevent mix-ups.
Line graph	A graph used to show a continuous measurement (y) changing over time or another continuous variable (x).

Worked examples (follow the reasoning)

Example 1. A group tests whether caffeine raises resting heart rate. They give one group coffee and one group water and measure heart rate. Identify the independent variable, dependent variable, and control group.

- Find what is purposely changed: the drink (coffee vs. water) -> independent variable.
- Find what is measured in response: heart rate -> dependent variable.
- Find the no-treatment baseline group: the water group -> control group.

Answer: Independent = drink (coffee vs. water); Dependent = heart rate; Control = water group.

Example 2. After a fingerstick glucose test, a student has a used lancet, a cotton ball with a little blood, and a glucose test strip. How should each be handled for safe disposal?

- Lancet is a sharp -> place in the sharps container.
- Blood-soiled cotton ball is biohazard waste -> place in the biohazard (red) bag.
- Used test strip with blood is also biohazard waste -> biohazard bag, not the regular trash.

Answer: Lancet -> sharps container; bloody cotton ball and test strip -> biohazard waste bag.

Practice questions (with reasoning)

1. A study changes the running speed on a treadmill and records breathing rate. What is the dependent variable?

- A. Running speed
- B. Breathing rate
- C. Treadmill brand
- D. Room temperature

Answer: B. Breathing rate is what is measured in response to the change in speed.

2. Which storage choice is correct for a blood specimen that will be tested in two days?

- A. Leave on the lab bench
- B. Refrigerate at 2 to 8 degrees C
- C. Place in a sunny window
- D. Tape it to the centrifuge

Answer: B. Short-term blood storage is refrigerated to slow degradation.

3. Increasing the number of subjects from 4 to 40 mainly improves:

- A. How the data is colored
- B. How well the sample represents the population
- C. The independent variable
- D. Disposal time

Answer: B. A larger sample size better represents the population and improves reliability.