Name: _____ **Date:** _____

When Peer Review Bites Back: Advancing the Scientific Method for Seniors

Navigate 10 high-stakes inquiries into epistemological rigor, statistical nuances, and the ethics governing modern laboratory investigations.

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1. A researcher utilizes Bayesian inference instead of frequentist p-values to evaluate the probability of a hypothesis. Which of the following best describes the advantage of this approach in complex data analysis?

A. It guarantees that the Null Hypothesis is false if the p-value is below 0.05.
B. It allows for the incorporation of prior knowledge or previous experimental data into the current statistical model.
C. It eliminates the need for a control group by using mathematical simulations.
D. It proves causation rather than correlation through iterative algorithmic loops.

2. In a double-blind longitudinal study, the 'observer effect' is entirely eliminated because the participants are unaware of whether they are receiving the treatment or the placebo.

A. True
B. False

3. When a scientist selects only the data that supports their specific hypothesis while ignoring outlying data that contradicts it, they are engaging in a practice known as _____.

A. Data Archiving
B. Double-blind Verification
C. Cherry-picking
D. Inductive Reasoning

4. During the 'Conclusion' phase, a 12th-grade physics student finds that their results are statistically insignificant. According to the NGSS framework for evaluating evidence, what is the most scientifically rigorous next step?

A. Discard the results and repeat the experiment until the data matches the hypothesis.
B. Modify the hypothesis post-hoc to align with the observed data set.
C. Analyze the experimental design for systemic errors and suggest a refined methodological approach for future peer review.
D. Publish the findings as 'proven' while omitting the error bars from the final graph.

5. The primary difference between a scientific theory and a scientific law is that a theory eventually becomes a law once it has been tested enough times by different researchers.

A. True
B. False

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6. To ensure the reliability of a complex biochemical assay, researchers must account for ____ variables, which are outside factors that could unintentionally influence the relationship between the independent and dependent variables.

A. Categorical
B. Confounding
C. Discrete
D. Ordinal

7. Which epistemological concept suggests that for a hypothesis to be considered scientific, there must be a theoretical observation that could prove it wrong?

A. Occam's Razor
B. The Anthropic Principle
C. Falsifiability
D. Peer Correlation

8. In the context of the Reproducibility Crisis, a 'meta-analysis' is a statistical technique that combines results from multiple independent studies to determine the overall effect size of a phenomenon.

A. True
B. False

9. The principle of ____ states that when competing hypotheses are equal in explanatory power, the simplest one with the fewest assumptions is usually the correct one.

A. Parsimony
B. Entropy
C. Causality
D. Deduction

10. When designing a trial for a new CRISPR-based gene therapy, why is 'Informed Consent' categorized as a step in the ethical scientific protocol rather than just a legal requirement?

A. It ensures the population sample is large enough for a Chi-square test.
B. It protects the integrity of the human subject and ensures the beneficence of the experimental design.
C. It acts as a control variable for psychological influence.
D. It is necessary to secure patent rights for the final data analysis.