Name: _____ **Date:** _____

When Paradigms Shift: A College Guide to Scientific Inquiry

Can we ever truly prove a theory? Analyze the epistemological boundaries of falsification, Bayesian inference, and the replication crisis in modern research.

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1. In the context of Karl Popper's philosophy of science, which criterion distinguishes a scientific theory from a pseudoscientific one?

A. The accumulation of inductive evidence supporting the claim
B. The inherent risk that the theory can be falsified by empirical observation
C. The consensus of the scientific community regarding its validity
D. The mathematical complexity and predictive accuracy of the model

2. In a robust experimental design, researchers must account for _____ variables, which are extraneous factors that correlate with both the dependent and independent variables, potentially leading to a type I error.

A. Control
B. Confounding
C. Categorical
D. Continuous

3. The Bayesian approach to the scientific method emphasizes the updating of prior probability distributions with new evidence to reach a posterior probability, rather than relying solely on p-values.

A. True
B. False

4. Thomas Kuhn's 'The Structure of Scientific Revolutions' suggests that 'normal science' operates within a framework that remains unchallenged until what occurs?

A. A peer-reviewed journal rejects a major finding
B. The government ceases funding for traditional research
C. Anomalies accumulate that the existing paradigm cannot explain
D. A new generation of scientists enters the workforce

5. When a researcher selectively reports only the data that supports their hypothesis while ignoring non-significant results, they are engaging in a practice known as _____.

A. Double-blinding
B. Meta-analysis
C. P-hacking
D. Regression

6. In a double-blind randomized controlled trial, the participant is aware of the treatment group assignment, but the researcher administering the treatment is not.

Name: _____ **Date:** _____

A. True
B. False

7. Which of the following best describes the 'Replication Crisis' currently affecting social and biomedical sciences?

A. A lack of funding for new, original research papers
B. The inability of independent researchers to reproduce the results of published studies
C. The rise of AI-generated content in scientific databases
D. Arguments between scientists regarding the definition of a scientific law

8. The principle of _____, often referred to as Occam's Razor, suggests that when presented with competing hypotheses that make the same predictions, the one with the fewest assumptions should be selected.

A. Parsimony
B. Empiricism
C. Determinism
D. Reductionism

9. What is the primary role of an Institutional Review Board (IRB) in the method of scientific inquiry involving human subjects?

A. To ensure the statistical significance of the results
B. To provide funding and resources for experimental equipment
C. To protect the rights and welfare of participants by reviewing ethical considerations
D. To facilitate the publication of results in high-impact journals

10. A scientific 'Law' is a hypothesis that has been upgraded because it has been proven with 100% absolute certainty.

A. True
B. False