

Name: \_\_\_\_\_ Date: \_\_\_\_\_

## When Hypotheses Fail Advanced College Quiz

Can you distinguish between post-hoc rationalization and legitimate theory revision? Analyze the epistemological boundaries of falsifiability and rigorous experimental design.

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**1. In a double-blind longitudinal study investigating the efficacy of a new neuroplasticity drug, the 'Penta-Influence' effect occurs when researchers inadvertently signal expectations through micro-expressions. This phenomenon primarily threatens which aspect of the scientific method?**

- A. External validity and generalizability
- B. Internal validity via investigator bias
- C. The null hypothesis significance testing (NHST) framework
- D. Statistical power and effect size

**2. According to Karl Popper's principle of demarcation, a theory that cannot be falsified by any conceivable empirical event is considered scientifically superior because of its absolute resilience.**

- A. True
- B. False

**3. When a researcher observes a correlation between two variables and assumes causation without accounting for a third, unmeasured variable, they have fallen victim to the \_\_\_\_\_.**

- A. Directionality problem
- B. Type II error
- C. Third-variable problem
- D. Survivorship bias

**4. A team of astrophysicists detects an anomaly in galactic rotation curves that contradicts current Newtonian models. Instead of discarding the model, they propose the existence of 'Dark Matter.' This move is an example of:**

- A. Ad hoc hypothesis modification
- B. Inductive reasoning error
- C. The heuristic of representativeness
- D. Occam's Razor misapplication

**5. In the context of the Replication Crisis in social sciences, the practice of selectively reporting only significant results while ignoring non-significant ones is known as \_\_\_\_\_.**

- A. Data dredging
- B. The file drawer effect
- C. Bayesian inference
- D. Double-blind masking

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**6. A 'Type I Error' occurs when a researcher fails to reject a null hypothesis that is actually false, essentially missing a real discovery.**

- A. True
- B. False

**7. Thomas Kuhn's 'The Structure of Scientific Revolutions' suggests that most scientific work occurs within a 'normal science' phase. What triggers a 'Paradigm Shift'?**

- A. A single successful experiment that proves a new law
- B. The accumulation of anomalies that the current paradigm cannot explain
- C. A popular vote among the international scientific community
- D. The discovery of a more expensive research technology

**8. A sequence of reasoning that moves from specific observations to a generalized conclusion, often used in generating hypotheses, is called \_\_\_\_\_.**

- A. Deductive reasoning
- B. Syllogistic logic
- C. Inductive reasoning
- D. Abductive reasoning

**9. In a truly controlled experiment, every single variable except for the independent and dependent variables must be kept constant to isolate the causal effect.**

- A. True
- B. False

**10. A pharmaceutical study finds a p-value of 0.049. While statistically significant at the  $\alpha = 0.05$  level, what does this actually signify regarding the 'truth' of the hypothesis?**

- A. There is a 4.9% chance the null hypothesis is true
- B. The effect size is large enough to be clinically meaningful
- C. There is a 4.9% probability of observing these results if the null hypothesis is true
- D. The experiment is 95.1% likely to be replicated successfully