

**Study Questions: Philosophy of Science and Scientific Methodology  
and Progress**  
**Conservation Biology**  
Spring 2009

1. What is materialism and why must it be seen as an assumption – for that matter, what is vitalism what assumptions does it involve?
2. What is the role of observation in formation of inductive generalizations (and what are inductive generalizations) and in experiments?
3. Why should falsifiability and not "prove-ability" be the requirement of a scientific hypothesis? Who was Karl Popper?
4. What causes variation in experimental observations and how does this affect the interpretation of results?  
Why are inferential statistics needed?  
What is the role of inferential statistics in hypothesis testing?
5. Why does reductionism stem directly from materialism – and why are connections between materialism and emergence more tenuous?  
What did your instructor mean by "hard and soft emergence?"
6. Describe normal science and contrast it with a scientific revolution. How do scientific paradigms tend to structure the way scientists see their work and interpret their experimental results during a period of normal science?
7. Why is science dynamic and why should the term "proof" be avoided – or at least used in a context that implies a different meaning from its use in mathematics and logic?
8. Besides observational errors, what else leads scientists to make mistakes in terms of how they interpret what they observe? – Hint: think about *zeitgeists* and consider question #6.
9. Distinguish between theory, hypothesis and law – as they should be used in science. Please give a couple of examples of important biological laws and of theories/hypotheses.
10. What is parsimony?

Please also remember to be familiar with the answers to the study questions given at the end of the notes.