Philosophy of Science
Professor Stemwedel
Spring 2012

# FINAL EXAM REVIEW SHEET

Important concepts and terminology

metaphysics
epistemology
descriptive vs. normative

norms of science
"Strong Program" sociology of science
naturalism

objectivity
intersubjectivity
ways the peer review system is supposed to improve objectivity

theoretical entities
observable vs. unobservable entities
empirical adequacy
realism vs. anti-realism
an argument for realism
an argument against realism
entity realism

explanation
"Covering law" or "Deductive-Nomological" model of explanation
problems with the covering law model of explanation
bridge laws

falsification
confirmation vs. corroboration
progressive vs. degenerating research programs
independent testability

deductive reasoning
inductive reasoning
analytic vs. synthetic statements
underdetermination
holism

paradigm
normal science
puzzle-solving
anomaly
crisis
revolution
incommensurability
scientific progress

Questions about the reading:

- What, according to Lakatos, distinguishes a progressive research program from a degenerating one?
- What does Duhem say about our ability to test hypotheses against experiments?
- What role does Kuhn think a paradigm plays in a normal science tradition?
- Explain why Kuhn thinks unsolved puzzles *don't* automatically lead to a change in scientific theory.
- What factors does Kuhn say scientists consider when choosing between paradigms?
- What, according to Laudan, is the difference between accepting a theory and pursuing a theory?
- Explain Feyerabend's principle of proliferation and principle of tenacity.
- How does Longino's understanding of objectivity differ from the view she attributes to traditional philosophy of science?
- According to Hempel and Oppenheim, what is required for a good explanation?
- According to Merton, what are the four norms of science?
- How could a naturalist use information about "perceptual modules" to respond to Kuhn's claim that all observation is theory-laden?
- Explain what a constructive empiricist commits to when accepting a scientific theory, and briefly discuss why van Fraassen thinks this commitment is more warranted than the realist's commitment.

**EXAM FORMAT:**

6 true/false
5 multiple choice
18 fill-ins (with a "well" to choose from)
6 very short answer questions (about 3 sentences each) – *you can choose which 4 to answer*
1 evaluation of a scientific hypothesis or argument (about 1 paragraph) identifying parts of explanations

**You may bring a single page (8.5 by 11 inches) of notes to use in the exam.**
**You do not need to bring a blue book or scantron sheet.**

Sample exam questions

*True/False:*

1. Maxwell thinks that there are no entities in scientific theories that are in principle unobservable. TRUE FALSE
2. All naturalists think philosophical questions should be replaced by scientific questions. TRUE FALSE
3. Kuhn claims that the choice between competing paradigms in science is usually made on the basis of objective factors. TRUE FALSE
4. Kuhn claims that scientists abandon their hypotheses immediately once experiments or observations seem to falsify them. TRUE FALSE

*Multiple choice:*

1. Van Fraassen claims that we should NOT commit to believing:
   A. Claims a theory makes about what is observable.
   B. Claims a theory makes about what is unobservable.
   C. Claims a theory makes about what has been observed so far.
   D. Claims a theory makes about what will be observed in the future.

2. Feyerabend thinks good empiricism requires:
   A. Seriously investigating a number of different theories which aim to account for the same phenomena.
   B. Requiring a new theory to explain the success of the old theory it replaces.
   C. Accepting well-confirmed theories and rejecting theories that are not well-confirmed.
   D. An appeal to facts which are theory-independent.

3. Longino thinks:
    A. Objective knowledge is the sort of thing an individual scientist can achieve by following the scientific method.
    B. Science creates reliable knowledge by means of a transformative interaction between different observers.
    C. It is impossible for humans to get reliable knowledge about the world.
    D. All of the above.
    E. None of the above.

*Fill in the blanks:*

1. _____ is the branch of philosophy dealing with what we can know and how we can come to know it.

2. The "ultimate argument" attempts to show that the predictive success of our scientific theories compel us to take a(n) _____ attitude toward them.

3. Concluding, from all the sunrises you have experienced or heard about, that the sun will rise tomorrow is an example of _____ reasoning.

4. Van Fraassen says Maxwell confuses unobservable entities with _____ entities.

5. The "Strong Program" in sociology of science claims that scientific beliefs, like other beliefs, are justified relative to _____ factors.

WELL:
anti-realist
realist
inductive
deductive
bridge laws
epistemology
metaphysics
theoretical
local
global
falsification

**Evaluation of a scientific claim:**
Recently, a new product was introduced called The Laundry Solution. It consisted of a hard plastic ball filled with a blue liquid. Its makers claim this product eliminates the need for laundry soap. Just put the ball in the washing machine with your laundry and everything will come clean without the need for soap.

The manufacturers of The Laundry Solution claim that that liquid within the ball is specially structured water that emits a negative charge through the walls of the ball into the laundry water. This causes the water molecule cluster to dissociate, allowing much smaller individual water molecules to penetrate into the innermost parts of the fabric.

*Design a thorough and simple test of some of these claims using only common household items (e.g., dirty clothes, a washing machine, etc.). Identify the claim(s) you are testing, describe the test, and explain what outcomes would support or undermine the claim(s).*

*Given the testable claims that could **not** be tested in a household setting, what is the **most** your test could let you conclude about the efficacy of The Laundry Solution?*

**Evaluation of a scientific claim:**
Your friend has purchased a supply of a new pill (formulated of "natural botanicals") that promises to aid in weight loss. The package insert promises that, when taken with a 2000 calorie per day diet and accompanied by 30 minutes of brisk activity per day, the pills will lead to weight loss. A 30-day supply of the pills costs $100. You suspect that your friend has been cheated.

*Propose a simple experiment to determine whether the pills have any effect on weight loss.*

*Here are two explanations for a sample of salt dissolving:*

1. The salt was placed in liquid water.

2. Salt dissolves in liquid water.

   Therefore, the salt dissolved.

1. The salt was placed in water.

2. Salt is an ionic solid, composed of positively and negatively charged ions held together by electrostatic attractions.

3. Liquid water consists of polar water molecules arranged with their positive ends associated with the negative ends of neighboring water molecules, and with their negative ends associated with the positive ends of neighboring water molecules, through strong dipole-dipole attractions.

4. When an ionic solid is placed in a polar liquid, the positively charged ions are surrounded by the negative ends of the polar molecules and the negatively charged ions are surrounded by the positive ends of the polar molecules, increasing the entropy and creating a solution.

5. The positively charged sodium ions were surrounded by the negative ends of the water molecules and the negatively charged chloride ions were surrounded by the positive ends of the water molecules, increasing the entropy and creating a salt solution.

   Thus, the salt dissolved.

***LABEL:***
***The fact being explained by each explanation***
***The law(s) of nature***
***The bridge law(s)***