

## Phil. 125: Philosophy of Science

### Second Assignment (Take Home Exam Version)

#### Instructions

Answer any *four* of the following questions, 2–3 pages for each answer, for a total of 8–12 pages. You may hand in your answers early if you like, but all answers are due by Wed., Dec. 6, in my office, Cowell Annex A-106, by 5:00pm.

The questions are keyed to different reading assignments, with the idea that each question is raised most centrally in a certain part of the reading. However, you can and should use material from anywhere in the text where it's relevant to the answer. (You will only have to answer four questions total, out of the one's below and/or the new ones that are coming.)

Because these are answers to questions rather than papers, I will give priority to accuracy over originality in grading. (If you have original ideas you should choose the paper option.) However, all the questions do require some thought; they can't simply be read out of the texts. And, of course, as usual, your answer must be "original" in the sense that it is your own work. (If you use any outside source—which I *don't* recommend—you must cite it.)

#### Questions

1. Popper, *LSD*, ch. 1 and 2: choose one of the following three statements and explain why you think it is right (I think all three are defensible, though maybe not equally so): (a) Popper's main point is to show that the "problem of indication" doesn't have a positive solution, and to explain how we can nevertheless learn something about universal laws. He discusses the "demarcation problem" because of that main point. (b) Popper's main point is the role of falsifiability in answering the "demarcation problem." He discusses other methodological issues and the "problem of induction" because of that main point. (c) Popper's main point is the relationship between science and the methodology of science. He discusses falsifiability and the "problem of induction" because of that main point.
2. Popper, *LSD*, ch. 3: Explain why Popper's conception of a "theoretical system" (§16) might lead one to regard the axioms as "conventions," and why Popper wants to avoid that. Your explanation should involve (at least) the following: theories (what is a "theory"?); axioms; definitions; "strict" universals.

3. Popper, *LSD*, ch. 4: Explain *one* of the following points about Popper's view (all of which are correct): (a) No falsifiable theory forbids only a single basic statement. (b) Forbidding (any number of) basic statements is not enough to make a theory falsifiable. (c) A theory cannot, in general, be falsified by a single accepted basic statement.
4. Popper, *LSD*, ch. 5: What is "Fries's Trilemma"? (Do not quote from the text to answer this; you must explain in your own words.) How is Popper's view on "basic statements" supposed to resolve it? How is this connected with his reason for rejecting all versions of "protocol sentences," including even the version Carnap (in "On Protocol Sentences") claims to have taken from Popper?
5. Popper, *LSD*, ch. 10: Explain why Popper's view (as opposed to the view he describes as "inductivist") makes it hard to understand why we *rely on* corroborated theories. How would Popper respond to this objection?
6. Neurath, Putnam, Lakatos: Choose one of the following examples and explain why (according to one or more of the three authors) it causes a problem for Popper: Newton's derivation of Kepler's laws; the discovery of Neptune; the orbit of Mercury. How might Popper respond? Is the response satisfactory?
7. Kuhn, *SSR*, ch. 1–5: On p. 34, Kuhn claims that three activities ("determination of significant fact, matching of facts with theory, and articulation of theory") make up all the experimental and theoretical work of normal science. Explain what each of these activities is, using examples where helpful, and explain why, according to Kuhn, they could *not* be motivated by a desire to test theories, to uncover unexpected novelties, or to be useful, but *could* be motivated by a desire to solve "puzzles."
8. Kuhn, *SSR*, ch. 6–8: Discuss either the discovery of oxygen or the discovery of X-rays, focusing on the role of "anomalies" and the ways in which the nature and role of such anomalies, according to Kuhn, are both like and unlike the nature and role of falsifying instances/hypotheses as described by Popper. Explain further how the process in question is supposed to resemble the kind of "theoretical" crisis described in ch. 7.
9. Kuhn, *SSR*, ch. 9–10: How might a "positivist" (as described by Kuhn, beginning around p. 98) tell the story of Galileo's discoveries about the behavior of pendulums? How would such a positivist argue that these discoveries were not incompatible with older theories? (See especially what Kuhn finally notes on p. 124: that Aristotelians didn't discuss swinging

stones at all.) Why is the positivist's description wrong, according to Kuhn? Give at least two reasons. (Discuss what goes wrong in this particular case, but with reference to some of the supposed general facts about the "nature and necessity" of scientific revolutions—to quote the title of ch. 9—which guarantee that all such stories will be wrong.)

10. Kuhn, *SSR*, ch. 11–13: On p. 149, Kuhn says: "The laymen who scoffed at Einstein's general theory of relativity because space could not be 'curved'—it was not that sort of thing—were not simply wrong or mistaken." This might be taken to mean that laymen are better placed to criticize new developments in science that we usually tend to think. Is that the moral Kuhn would want us to draw? Explain why or why not.
11. Hacking: On p. 12, Hacking remarks that certain "reflections" of Kuhn's "do not show that a non-rational change of belief might not also be a switch from the less reasonable to the more reasonable doctrine." This is questionable: what would Popper say about the suggestion that a non-rational method would lead to a "more reasonable doctrine" (hint: see again the Addendum at the end of ch. 10 of Popper's *LSD*). Getting back to Hacking, however: what "reflections," or arguments, of Kuhn's is he referring to, and why, from Hacking's point of view, does it seem like they must have a crucial role in any Kuhnian attack on the rationality of science? Since they "do not show" what such an attack apparently ought to show, what does Hacking suggest as an alternative understanding of Kuhn's strategy?