Paper Assignment. Due Monday May 8.

(a) Choose one of the following topics and respond to it in an essay of no less than 5 pages and no more than 7 pages (not including title page and bibliography). Your paper should be typed, 10- or 12-point, double-spaced and spell-checked. Please submit your paper to the link in the NYU-Brightspace Assignments folder.

(b) Your essay should conform to the Paper Guidelines available on the second course website research.engineering.nyu.edu/~jbain/philqm. Make Absolutely Certain that you have read and understood these guidelines before you attempt to begin writing your essay. If you do not follow these guidelines, the grade for your essay may suffer!

(c) All papers must include a bibliography with at least 2 entries (at least one of these should be from the list of required class readings). Your essay must use this bibliography as a source to cite for all claims and quotes you attribute to authors. If you do not include a bibliography that you cite for claims and quotes, the grade for your essay may suffer! Lecture notes should NOT be listed or referred to in your essay. Lecture notes merely summarize topics in the texts and related material. Similarly, online lecture notes from other sources should not be listed or referred to. Be extremely careful of other types of online sources that have not been vetted by me. If you are in doubt as to the reliability of an online source please check with me before using it.

(d) Please make use of Tandon's Writing Center if you have trouble with spelling or grammar. If your essay contains so many spelling/grammatical errors that a reader cannot understand what your claims are, then your grade may suffer. Information about Tandon's Writing Center can be found at http://engineering.nyu.edu/academics/support/polytechnic/writing.

(e) *Late paper policy*: There are no extensions on paper due dates. Late papers will be accepted but will be given an initial penalty of a third of a grade point, and a further penalty of a third of a grade point for every period of 7 days after the due date. *Example*: An A paper turned in 1-7 days late will receive an A-. An A paper turned in 8-14 days late will receive a B+. An A paper turned in 15-21 days late will receive a B, *etc*. *Under no circumstances will late papers be accepted after the date of the final.*

1. Quantum mechanics and classical mechanics differ crucially in how they represent three key physical concepts: the state of a physical system, the properties of a physical system, and the values of the properties of a physical system. Explain what these concepts are, how quantum mechanics and classical mechanics differ in representing them, and some of the consequences of this difference.

2. What is involved in quantum teleportation? Explain both its theoretical and experimental bases.

3. What are the prospects for quantum computers? How would they be different from classical computers?

4. The Schrödinger's Cat thought experiment points to an aspect of quantum mechanics that many find troubling. What is that aspect? How might we seek to escape it?

5. In interpreting quantum mechanics, it is not the case that "anything goes". First explain why anyone should be concerned with interpreting quantum mechanics. Then explain in detail what sort of constraints are imposed on any attempt to interpret quantum mechanics.

6. Pick one of the following interpretations of quantum mechanics and describe its basic tenets. Then explain how it addresses the following constraints on interpretations: Bell's Theorem, the Kochen-Specker Theorem, the Measurement Problem. In your opinion, is it successful?
(a) Many Worlds   (b) Many Minds   (c) GRW   (d) Bohm's Theory
(e) KHS Modal   (f) Quantum Logic   (g) Consistent Histories

7. Advocates of decoherence claim it solves the Measurement Problem. Explain what their argument is and critically analyze it.