

## A.5 Final Exam Study Guide

The final exam will take place on Thursday, 12/11, 1:10 to 3:10 in the regular classroom. It will start at 1:10 sharp. Please be on time so that not to disturb your fellow students.

The final exam is closed notes, closed books. It will cover all the material covered over the semester. It will consists into two parts:

1. Definitions – you will be asked to define technical terms that we encountered during the semester. Make sure to provide an example to illustrate your definition.
2. Short Questions – you will be asked to give short and simple answers to short and simple questions. You should aim at explaining yourself fully but concisely. Concretely, you should not expect to be able to answer with just one sentence. More than a paragraph, on the other hand, is probably too much.

Keep in mind that clarity is really important. Keep your sentences short. Make the logical links of your reasoning explicit.

### A.5.1 Definitions

I will choose **12** of the following terms. You will be asked to choose and define **10** of the 12 that I will have chosen.

1. metaphysics
2. epistemology
3. scientific realism
4. scientific instrumentalism
5. worldview
6. normal science (in Kuhn's sense)
7. anomalies (in Kuhn's sense)
8. crisis science (in Kuhn's sense)
9. scientific revolutions (in Kuhn's sense)
10. correspondence theory of truth
11. coherence theory of truth
12. deductive reasoning
13. inductive reasoning

14. hypothetico-deductive model of science
15. hypothesis (in Newton's sense)
16. experimental laws (in Newton's sense)
17. physical theory
18. interpretation of a physical theory
19. theism
20. deism
21. natural religion
22. methodological naturalism
23. metaphysical (or ontological) naturalism
24. uniformitarianism
25. actualism
26. gradualism
27. darwinisticism
28. neo-darwinism
29. saltationism
30. orthogenesis
31. modern synthesis

### A.5.2 Short Questions for Short Answers

I will choose **12** of the following questions. You will be asked to choose and answer **10 of the 12** that I will have chosen.

1. What is the old view of science and of scientific development that Kuhn think is misguided? What is the new view of science and of scientific development that Kuhn advocates?
2. What is the main problem that the correspondence theory of truth faces?
3. What are the fundamental constituents of the world according to Aristotle?

4. What are the four causes? Illustrate with an example. Explain what it means for Aristotle that natural objects have final causes.
5. How do the ways of explaining the world of the first philosophers differ from the mythologies of Homer and Hesiod?
6. What are Plato's Forms? Explain how the Forms differ from the sensible things and how postulating the existence of the forms is supposed to solve the problem of knowledge as formulated by Heraclitus.
7. What is the simplest form of:
  - (a) confirmation reasoning?
  - (b) disconfirmation reasoning?
8. What are auxiliary hypotheses? Explain how the fact that we need to make auxiliary hypotheses is a problem for the confirmation and the disconfirmation of scientific theories.
9. Explain briefly the differences between Ptolemy's and Copernicus' cosmological systems. Which reasons could a scientist of the times have to favor Ptolemy's system over Copernicus'? Copernicus' over Ptolemy?
10. What are the main motivations that lead Kepler to the elliptic orbits of the planets?
11. Which new evidence did the telescope give to scientists? How does this new evidence conflict with some of the core notions of the Aristotelian worldview?
12. Explain the main elements of Newton's worldview, contrasted with Aristotle's
13. Explain how we can understand Newton's famous defense of his law of gravitation: "I frame no hypothesis"
14. What is the problem of induction as Hume formulated it?
15. Explain Hempel's raven paradox? How is it relevant to the issue of confirmation of scientific theories?
16. Explain the new riddle of induction as formulated by Goodman. How is it relevant to the theories of confirmation?
17. What the three main claims of the Duhem-Quine thesis? Explain.
18. What is falsifiability? How is it relevant to the issue of demarcation between sciences and non-sciences?
19. What are the two postulates of the special theory of relativity? How do they modify our views on space, time, and simultaneity?

20. What are the two postulates of the general theory of relativity? Explain how the elevator thought experiment illustrates the second postulate. How does the theory modify our view of gravity and spacetime?
21. Explain Kuhn's argument that paradigm choice cannot be a matter of logic and experiment alone.
22. Which objective standards does Kuhn think come into play when scientists have to decide whether or not to accept a scientific theory? Why does he think these standards are not decisive? What kind of criterion come into play in addition to the objective criteria? How does he think they function? Explain. Does it
23. Which are the two big assumptions that Kuhn makes and that we can doubt are true?
24. Which conceptual beliefs of our worldview do quantum phenomena threaten?
25. With what is the state of a physical system represented in quantum mechanics? How do we get predictions about the result of a given measurement from this representation? Give an example. (No need to get too technical here unless you are comfortable with math)
26. What is the orthodox interpretation of quantum mechanics? How does this interpretation raises the measurement problem?
27. What are the three interpretative claims about quantum mechanics which the measurement problem shows to be impossible to maintain together? Which of these claims does (a) Bohm's theory, (b) the Many-Worlds interpretation, and (c) collapse theories abandon?
28. What is the world like according to Bohm's theory? according to the Many-Worlds interpretation? according to Collapse theories?
29. What is a state of superposition? what is entanglement?
30. Describe the experimental set up of a EPR-Bell-Aspect experiment. What does Bell's theorem say? What were the results of Aspect's experiment? What is the conclusion?
31. What were Cuvier's views on the origin of species? Did he believe in the possible transmutation of species? Did he believe that species can go extinct? How does he explain the existence of fossils?
32. Explain Lamarck's theory of evolution. Which is the main difficulty that Lamarck's theory faces?
33. Explain the main tenets of Darwin's theory of evolution. Which were the main objections against it?

34. Explain the analogy that Darwin makes between natural selection and domestic breeding. What is the goal of the analogy?
35. What is sociobiology? What is Gould's criticism against Wilson's ideas? What kind of middle ground can we conceive between all-nature and all-nurture types of explanations for morality?
36. What is Social Darwinism? Who were its main defendants? Can it be founded in Darwin's theory of evolution? Why or why not?
37. What are the main steps that lead to the modern synthesis? (make sure to explain what the modern synthesis is ) Give at least two ways in which the modern synthesis has been refined in recent years.
38. Give a rough timeline for the different waves of religious attacks against evolution in the US. How can we explain the opposition to the theory of evolution in the US population?
39. Give at least three reasons why Creationism and Intelligent Design cannot be considered as scientific theories in competition with the theory of evolution.
40. What are the various ways in which one can conceive the relationships between science and religion?