Study guide Spring 2026

Introduction to the History and Philosophy of Science Christian Wüthrich

1 General instructions

Make sure you have read the instructions carefully. Some students lose crucial points simply for not following the instructions.

Regardless of whether you take the course as an annual course or just for one semester, the exams take place at the end of each semester:

- If you take the course for the fall semester only, then you take the exam in late January or early February.
- If you take the course for the spring semester only, then you take the exam in early June.
- If you take the course as an annual course, then you will take both exams, i.e., in late January/early February as well as in early June.

Each exam will be a written exam of 2 hours (anonymised), at the end of each semester in order to validate the corresponding semester.

The written exam will be **closed books**, which means that you will not be allowed to use books, notes or electronic devices with memory or communication functions during the exam. The different subjects covered in the course will have more or less the same relative importance.

The topics and problems below (see the topics for the relevant semesters) give you a list of material that can be covered in the exams. Study them carefully. The examination will consist of three parts. The first part will consist of ten **identification questions**. You will be asked to characterise or define a term or expression using one or two short sentences. The second part will consist of six **questions requiring short answers** for which I expect one-paragraph answers. In this second part, you will sometimes be able to choose from two questions. In the third part, there will be one **essay question** which will require an argumentative text, in which you will draw on all the relevant content from the course.

The evaluation of the exam is anonymous.

2 Topics Spring 2026

Scientific explanation

- The deductive-nomological model of explanation (including conditions of adequacy)
- difficulties of the D-N model: the D-N model as unnecessary and as insufficient (know an example for each)

Laws of nature

- difference between accidental generalisations and laws (example: difference between Newton's law of universal gravitational and Bode's 'law')

- counterfactual support of laws
- governing/non-Humean vs Humean conceptions of laws
- best-systems analysis
- primitivism

Chemical revolution

- imponderables and forces
- Paracelsus's notion of 'principles'
- main ideas of phlogiston theory (not all basic principles by Pott)
- Priestley and his interpretation of his discovery of oxygen
- Lavoisier's concept of oxygen and hydrogen, and the compound nature of water
- main ideas of caloric theory
- new classification and nomenclature
- Davy's destruction of Lavoisier's chemistry
- Dalton's chemical atomism

Natural kinds and topics in the philosophy of chemistry

- reduction of molecular species to quantum physics
- reduction of substances to molecular species
- natural kinds and chemical kinds
- What are natural kinds? 3 conditions, and Hendry's arguments against each
- Two views of chemical substances: microstructuralism and macroscopic conception of substance (you should know an argument in favour of the former)

Spacetime

- Relationalism and substantivalism about space (and time)
- Newton's bucket experiment, and Mach's interpretation
- Einstein's comparison involving the magnet and the conductor
- Relativity principle and light postulate
- The relativity of simultaneity
- The principle of equivalence (in at least one of its versions)
- At least one measurable consequence of Einstein's theory of general relativity

Please note that gravitational waves and black holes will not be part of the exam.

The history and philosophy of artificial intelligence

- Perceptron, and deep neural networks
- Definitions of AI
- Opacity of AI models (notions, epistemic consequences)

History of biology from Mendel to the Holocaust

- general idea of racial purity
- positive and negative eugenics
- Mendelian genetics: genes as difference makers
- Goddard's idea of 'feeblemindedness' as being transmitted as Mendelian recessive, and what is wrong with this idea
- 'Herausmendeln' ('mendel out') and its relation to the idea of racial purity

The 'Darwinian' and the 'molecular' revolutions in biology

- Kuhn's conception of a scientific revolution
- Lamarck's laws of evolution
- Darwin's argument in *Origin of Species* (pp. 42-46 of the slides)
- major gene concepts
- 'Darwinian' and 'molecular' revolutions (or rather: cumulative evolutions)

Quantum physics

- The double slit experiment with and without monitoring
- The Stern-Gerlach apparatus and spin measurements, combing devices
- The measurement problem (Maudlin's version)
- Quantum non-locality and Bell's theorem: just the main ideas, no details necessary