Study Guide 2025-2026 HPS

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 Fall 2025

History of philosophy of science

- Aristotle's theory of causality
- Newton's "hypotheses non fingo"
- Hume's solution to the problem of induction
- Mach's positivism

Science vs pseudoscience

- What is the demarcation issue?
- relevance of demarcation issue
- give some examples of criteria that could be used to demarcate science from pseudoscience

Arguments, deduction, induction

- singular and universal propositions
- observation and theoretical statements
- validity (deductive), truth, sound arguments
- general characteristics of deduction and induction, difference between the two
- Hume's problem of induction
- necessary connection between fallibility and ampliativity
- enumerative induction
- eliminative induction
- causal inference
- Mill's methods of agreement and difference
- inference to the best explanation, and its problems

Logical empiricism

- manifest of the Vienna Circle, empiricism and role of logic
- verificationist theory of meaning
- justification and epistemology of observation statements
- context of discovery vs context of justification
- the unity of science
- Nagel's model of inter-theoretic reduction
- homogeneous vs heterogeneous reduction, examples of both

Popper and falsificationism

- deductivism
- asymmetry between verification and falsification
- falsifiability, its definition and use as demarcation criterion
- degrees of falsifiability; generality, precision
- falsificationism

- conjectures and refutations
- problems of falsificationism:
  - observation statements
  - holism and immunisation of theories; ad hoc hypotheses
  - probabilistic hypotheses
  - scientific progress and corroboration (with Popper's response)

Scientific revolution

- main points of scientific revolution
- relevance of the Renaissance
- Aristotle's cosmos
- Paracelsus, Vesalius, Harvey
- Ptolemaic astronomy and its problems
- Copernican astronomy, its advantages and problems
- shipmast experiment
- idea of Galilean relativity in Bruno and Galileo
- Descartes and mechanical philosophy
- Newton and his problems with mechanical philosophy

Kuhn and scientific revolutions

- paradigm (broad and narrow sense)
- contrast with Popper
- normal science
- anomaly and crisis
- scientific revolutions and how they occur
- changing standards and Kuhn losses
- incommensurability (linguistic and methodological)
- two misunderstandings of incommensurability
- scientific progress according to Kuhn, its qualifications

Holism and underdetermination

- confirmation holism according to Duhem
- Duhem on crucial experiments in physics
- Quine's confirmation holism
- underdetermination of theories or hypotheses by data
- logical vs methodological underdetermination
- weak and strong methodological underdetermination

Induction and confirmation

- naive inductivism and Hempel's critique
- role of hypotheses, 'significant data'
- hypothetico-deductive reasoning, example of Blaise Pascal as illustration
- confirmation theory, general idea
- instantial model of inductive confirmation
- model of hypothetico-deductivism
- problems with the hypothetico-deductivist model:
  - Hempel's raven paradox (equivalence condition, instance condition), resolutions
  - Goodman's "new riddle of induction" (gruesome predicats), resolutions, application

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)

Scientific realism

- scientific realism
- no-miracles argument, and the antirealist Darwinian response
- constructive empiricism
- pessimistic meta-induction, weak and strong version
- structural realism
- argument from underdetermination of theory by data or observation
- base rate fallacy

3 Topics Spring 2026

To be determined.