

# Quantum black holes and holography

Master Physics and Astronomy

10 June 2022

---

## Oral exam

A random number generator determines which two of the seven questions (next page) you get. It doesn't get any more specific than that, those are the actual questions. You also get one question from the project that you worked on. The points are divided between theory and project as indicated (5 points per question + 5 on the project presentation).

Exam question: *Quantum black holes and holography*

Two questions from the following (2x5 points):

- 1) Action formulation of gravitational theories
- 2) Penrose diagrams
- 3) Black hole spacetime
- 4) Hawking radiation
- 5) Black hole thermodynamics
- 6) Properties of anti-de Sitter spacetime
- 7) The key holographic identity and its application(s)

One question from the project (5 points) + presentation (5 points). In total 20 points and as in studiefiche 50% project (what you did at home) and 50% lectures.