



## QuarkNet@INAAPT 2023: The Fine Print

Programs summary - *Too much information and still not complete!*

- Cosmic Ray Studies
  - Cosmic Ray Detectors at schools
  - Cosmic Ray e-Lab online
  - Cosmic workshops
  - International Muon Week (Feb-Mar)
  - International Cosmic Day (Nov)
- Teaching, learning, skills
  - Data Camp (Jul)
  - Coding Camps (Jun-Jul)
  - Coding workshops
- Data Activities - <http://cern.ch/qndap>
- LHC@CERN
  - Masterclass CMS and ATLAS (Mar)
  - World-Wide Data Day (Oct-Nov)
  - CMS e-Lab
  - LHC workshops
- Neutrino studies
  - MasterClass MINERvA and NOVA (March)
  - Neutrino workshops
- Summer Workshops at Centers - <http://cern.ch/qnwkshp>

From Indiana Physics Standards

- HS-PSII-10.1.\* Describe the Standard Model and explain the composition and decay of subatomic particles using the Standard Model and Feynman diagrams.
- HS-PSII-10.2.\* Explain the stability of the nucleus considering the electromagnetic repulsion in the nucleus and how forces govern binding energy and radioactive decay for different elements.
- HS-PSII-10.3.\* Qualitatively compare and contrast how particle interactions, fission, and fusion can convert matter into energy and energy into matter and calculate the relative amounts of matter and energy in such processes.
- HS-PSII-10.4.\* Apply the conservation of mass, conservation of charge, and conservation of linear momentum principles to describe the results of a radioactive particle undergoing either alpha or beta decay.
- HS-PSII-10.5.\* Know and describe how a particle accelerator functions and how current high energy particle physics experiments are being used to develop the Standard Model.

AP Physics 2

Unit 7: Quantum, Atomic, and Nuclear Physics

- 7.1 Systems and Fundamental Forces
- 7.2 Radioactive Decay
- 7.3 Energy in Modern Physics (includes  $E=mc^2$ )
- 7.4 Mass-Energy Equivalence
- 7.5 Properties of Waves and Particles
- 7.6 Photoelectric Effect
- 7.7 Wave Functions and Probability

IB Physics

Core Topic 7: Atomic, nuclear, and particle physics

Additional Higher Level Topic 12: Quantum and nuclear physics

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Slides and more from QuarkNet-INAAPT2023  
at <https://web.quarknet.org/files/inaapt23/>.