

**Radiation Oncology Initial Certification
Qualifying (Computer-Based) Exam:
Study Guide for Medical Physics for Radiation Oncology**

This exam tests your knowledge of the principles of radiation physics underlying the practice of radiation oncology. Included are questions on the general domains listed below. Exam performance will be reported to you based on an overall pass/fail grade, with specific information provided regarding quintile performance in the 10 individual domains. Because of the nature of scientific knowledge and subcategories, there may be some overlap of items across domains. Each exam will include items from every domain, but individual subtopics may not be included in every exam and the number of items per domain depends on the domain.

I.	Basic physics	15% to 19%
II.	Radiation measurements and basic treatment planning	23% to 27%
III.	Imaging, simulation, and treatment plan evaluation and verification	17% to 21%
IV.	Advanced treatment planning and special procedures	25% to 29%
V.	Safety, QA, and radiation protection	10% to 14%

The ranges above are those generally in effect for the exam to be administered in 2022 and are intended only for guidance in candidate preparation. They do not necessarily represent a precise number of scorable items.

I. Basic physics

- A. Fundamental Physics
- B. Atomic and Nuclear Structure
- C. Production of Kilovoltage X-ray beams
- D. Production of Megavoltage X-ray beams
- E. Radiation Interactions

II. Radiation measurements and basic treatment planning

- A. Radiation Quantities and Units
- B. Radiation Measurement and Calibration
- C. Photon Beam Characteristics and Dosimetry
- D. Electron Beam Characteristics and Dosimetry
- E. Systemic Radionuclide Characteristics and Dosimetry

III. Imaging, simulation, and treatment plan evaluation & verification

- A. Imaging Fundamentals
- B. Simulation and Treatment Verification
- C. Informatics
- D. Prescribing, Reporting, and Evaluating Radiotherapy Treatment Plans, including External Beam, Sealed, and Unsealed Sources

- IV. Advanced treatment planning & special procedures**
 - A. Intensity Modulated Radiation Therapy (IMRT)
 - B. Special Procedures
 - C. Brachytherapy, including LDR, HDR, and Unsealed Sources
 - D. Particle Therapy
 - E. Stereotactic Radiosurgery/Stereotactic Body Radiation Therapy

- V. Safety, QA, and radiation protection**
 - A. Quality Assurance
 - B. Radiation Protection and Shielding
 - C. Sealed and Unsealed Radiation Source Handling
 - D. Safety and Incidents

References: References are intended as resource for exam takers and will form the sources for the majority of individual items in the exam. Individual items may be sourced from references not cited in this study guide. Primary references are intended to be the source of the majority of exam items.

Secondary references are individual smaller categories of items. Additional references may be the source of individual, selected items.

Primary References:

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Secondary References:

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Metcalfe P, Kron T, and Hoban P. Physics of Radiotherapy X-Rays and Electrons. 2nd edition. WI: Medical Physics Publishing; 2007

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Additional References:

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Almond, P. R., Biggs, P. J., Coursey, B. M., Hanson, W. F., Huq, M. S., Nath, R. and Rogers, D. W. (1999), AAPM's TG-51 protocol for clinical reference dosimetry of high-energy photon and electron beams. Med. Phys., 26: 1847-1870. doi:10.1118/1.598691

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United States Code of Federal Regulations, Title 10, Chapter 1 – Nuclear Regulatory Commission, Part 20 – Standards for Protection Against Radiation. <https://www.nrc.gov/reading-rm/doc-collections/cfr/part020/>

United States Code of Federal Regulations, Title 10, Chapter 1 – Nuclear Regulatory Commission, Part 35 – Medical Use of Byproduct Material. <https://www.nrc.gov/reading-rm/doc-collections/cfr/part035/>