ABR Radiologic Physics

Initial Certification Study Guide

Computer-Based Examinations

PART 1: General

Basic radiologic physics including:
The nature and sources of radiation
Radioactivity
Ultrasound
Nuclear magnetic resonance
Interactions of radiation with matter
Spatial distribution and transmission of radiation
Concepts of dosimetry
Instrumentation and measurement techniques
Basic radiobiology
Radiation protection
Basic atomic and nuclear physics
Basic statistics

PART 1: Clinical

Clinical aspects of radiologic physics:
Physiology
Anatomy
Biochemistry
Medical uses of radiation sources
Radiochemistry
Medical terminology

PART 2: Diagnostic Radiologic Physics

Diagnostic Radiologic Physics
Diagnostic generating equipment and sources
Clinical diagnostic radiologic physics
Geometric considerations
Recording media and their applications
Information transfer theory
Sensitometry
Special devices and techniques (e.g., grids, magnification techniques,

ultrasound, magnetic resonance imaging, computed tomography, image intensifiers, video systems, computers, etc.)
Digital imaging
Image transmission
Dosimetry
Calibration of diagnostic equipment
Quality assurance
Radiation protection (including survey techniques and installation design)
Radiation safety

PART 2: Medical Nuclear Physics

Radioactive sources for diagnosis and therapy
Dosimetry
Clinical nuclear medicine physics
Radiation measuring and imaging equipment
Calibration of nuclear medicine equipment and devices
Information transfer theory
Image transmission
SPECT: Single Photon Emission Computed Tomography
PET: Positron Emission Tomography
Statistics of counting
Specific medical nuclear techniques
Computers
Anatomical and physiological considerations
Quality assurance
Radiation protection (including survey techniques and installation design)
Radiation safety

PART 2: Therapeutic Radiologic Physics

Radiation sources and units
Measurements of radiation quantity and quality
Physical principles of radiation therapy, treatment planning and setup
Clinical radiation therapy
Treatment planning for external beam therapy, brachytherapy, and stereotatic radiosurgery
Treatment simulation
Imaging applications to radiation therapy
Radiobiological principles of therapy
Dose calculations

Quality assurance
Calibration
Radiation protection (including survey techniques and installation design)
Radiation safety

Oral Examination

The oral examination is designed to test your knowledge and fitness to practice applied radiologic physics in the specified area(s). You will be examined by five physics examiners, each of whom will ask questions in the five physics categories of the examination.

If you are taking exams in more than one area of radiologic physics, you must take a full oral exam for each area. The exam categories are:

Radiation Protection and Patient Safety

Time, distance and shielding; workload, use and occupancy factors; shielding design for primary, scattered and leakage radiation; barrier calculation; report preparation; air concentrations of radioactivity; department design; radiation standards and units; radiation protection principles; radiation regulations and requirements; responsibilities of the radiation protection office; radiation surveys in diagnostic radiology, nuclear medicine and radiation therapy; characteristics of survey equipment; evaluation of radiation hazards; personnel monitoring; and related subjects.

Patient-Related Measurements

Calculation of dose from photon and particle beams and radionuclide sources; radiotherapy treatment planning; physical factors affecting dose (e.g., beam intensity,, field size, depth, thickness, filtration, half-life, screens, grids, concentration, etc.); special techniques and devices (e.g., rotational therapy, stereotactic radiosurgery; IMRT; wedge filters, infusion techniques, grids, tomography, computed tomography, ultrasound, computers and their applications, etc.); preparation of applicators; LDR and HDR brachytherapy; in vivo and in-phantom dose measurements; and related subjects.

Image Acquisition, Processing and Display

Principles of and techniques for image acquisition; image formation; digital imaging; computer-based image reconstruction; methods for image display; image analysis; image processing, image enhancement, fusion and segmentation; image artifacts; modulation transfer function; signal to noise ratio; and related subjects.

Calibration, Quality Control and Quality Assurance

Characteristics and use of calibration equipment; measurements of radiation quantity and quality; calibration and evaluation of ionizing and nonionizing radiation sources and installations; calibration and evaluation of measuring, recording and imaging devices; acceptance testing, commissioning, quality control and quality assurance; and related subjects.

Equipment

Principles and properties of radiation generating equipment; radiation sources; radiation receptors; radiation therapy equipment; diagnostic radiological equipment; nuclear medicine equipment; ultrasound equipment; nuclear magnetic resonance equipment; and related subjects.