ABR | AMERICAN BOARD OF RADIOLOGY

Initial Certification in Medical Physics

Part 3 Oral Exam Content Guide

The Oral Exam is designed to test your knowledge and fitness to practice applied medical physics in the specified specialty(ies). You will be examined by five physics examiners, each of whom will ask one question from each of the five physics categories of the examination.

Medical Physics Oral Exam Categories

The categories below are used for the Part 3 Oral Exam in medical physics. The category descriptions are general descriptions of the content of each category. In any particular examination, the material from the categories is sampled. Additional material related to the categories may be included as the field evolves. These categories are used in all oral exams, for both first-time candidates and candidates who have previously taken the oral exam.

Conditioned Exams

Candidates who conditioned the oral exams will continue to be examined in the category in which they were conditioned. You can find this information on your myABR cognitive expertise page. If you have questions, please email information@theabr.org or call 520-790-2900.

Content Guide

The content of all ABR exams is determined by a panel of experts who select the items based on a content guide that the ABR publishes. The content guides are assembled using guidance from medical physics organizations. The content guides are general documents, and individual exam items may not appear to be exactly congruent with the content listed in the guide. In addition, since there is only a limited number of items on any exam, selected items will only be a sample from the larger domain of the content guide.

SI Units

Beginning with the 2021 medical physics exams, the ABR will use strictly SI units. At present, some questions continue to use non-SI units. This will continue in 2019 and 2020 but will be discontinued after the 2020 exams.

DMP	Category Description
Radiography, mammography, fluoroscopy, and interventional imaging	• X-ray production, beam characteristics, interactions, and image-formation principles • Types and characteristics of image detectors • Clinical protocols for common imaging exams • Fluoroscopy and interventional procedures, including acquisition parameters and dose-reduction strategies • Image noise assessment and dose metrics for all projection imaging modalities • Common artifacts, quality assurance, quality control, mammography accreditation, and MQSA standards
Computed tomography	• CT system design and principles of operation, image-acquisition protocols, including helical acquisition and tube current modulation techniques • Cone beam geometry • Post-processing protocols, multi-planar and volumetric reconstruction • Quantitative CT • Image noise assessment, statistics, dose metrics (CTDI, DLP, SSDE), and effective dose estimation • Common CT artifacts, quality assurance, and CT accreditation program
MRI and ultrasound	• MR equipment, principles of magnetization, resonance, and excitation • MR pulse sequences, localization, acquisition, and processing • Ultrasound (US) principles, beam properties, acquisition methods, signal processing, and image display • Doppler US and color flow imaging principles and operation • Common artifacts for MRI and US, siting requirements for MRI, quality assurance, and accreditation for MRI and US
Informatics, image display, image fundamentals, professionalism and ethics	• Informatics infrastructure, standards, and patient security • PACS-modality connectivity, workflow, display, and archive functions • Image display requirements, characteristics, and calibration procedures • Image processing techniques and qualitative data extraction • Image fundamentals, sampling theory, and ROC analysis • Professionalism and ethics in clinical medical physics practice
Radiation biology, dosimetry, protection, and safety	• Radiation biology, radiation effects, and age/gender-specific risks • Radiation protection principles, guidelines, and regulations, radiation dosimetry, detectors, standards, and units • Radiation shielding design factors, barrier requirements, surveys, and reports • Patient safety and error-prevention issues, including dose reduction, sentinel events, and MR- and US-specific safety issues
NMP	Category Description

Radiation protection, safety, professionalism and ethics	• Internal dosimetry, including MIRD (formalism), fetal dose, units • Personnel safety, including facility surveys and occupational dose limits, radiation protection principals, personnel dosimetry • Safety for the patient, family and public (including exposure pathways, breastfeeding, and pregnancy) • Shielding including facility design and personnel protection • Regulations and regulatory bodies including medical event assessment, shipping and waste disposal, ALARA, time, distance and shielding, radiation surveys • Professionalism and ethics
PET and hybrids	• Radionuclide production and characteristics • QC procedures including ACR/TJC/NEMA and acceptance testing, artifacts • System principles, image fusion, random coincidences, scattered radiation, dead-time • Quantitative PET including SUV • Image reconstruction including attenuation correction, iterative reconstruction, filtered back projection
Single photon imaging systems including scintillation cameras, solid state cameras, and hybrids	• Radionuclide production and characteristics for SPECT and planar imaging • QC procedures including ACR/TJC/NEMA and acceptance testing, artifacts • System principles including scintillation cameras, solid state cameras, collimators, image fusion, system characteristics • Dynamic imaging, renograms, cardiac function, ejection fraction, tracer kinetics, lung shunt fraction • Image reconstruction including scanograms, attenuation correction, filters, edge enhancement, smoothing, unsharp masking, segmentation
Radiation measurements including dose calibrators, well counters, survey meters, thyroid probes	• Radioactivity measurement including dose calibrators, well counters, thyroid uptake probe, survey meters • Statistics, minimum detectable activity • Radiation detectors including survey meters, dead-time, personnel monitoring • Quantitative measurements including calibration • QC procedures including use of chi square, energy resolution, counting efficiency, geometry, linearity accuracy
Clinical procedures	• Radionuclide therapy including facilities, release criteria, radionuclide production • PET & hybrids • SPECT & hybrids including gamma cameras • Radiation dosimetry including risk, radiation protection, and CT dose • Radiopharmaceutical usage, thyroid imaging/uptake, informatics, display performance, misc.

TMP	Category Description
Reference and relative dosimetry	• Reference dosimetry: Absolute calibration for photons, electrons, protons, and low-energy x-rays • Ion chamber and electrometer design, characteristics, application, and QA • Other dosimeters design, characteristics, application, and QA • Survey detectors design and application • Film design, characteristics, application, and QA
Treatment machines	• Photon and electron medical accelerators • Proton units • Specialized machines (design and function) • Therapy imaging (including physics, equipment design, application, image reconstruction, acceptance testing, and commissioning) • Shielding and radiation safety
External beam treatment planning, uncertainty management, and treatment planning system QA	• Photon treatment planning • Electron treatment planning • Management of uncertainties • Treatment planning for specialized machines • Treatment planning system QA
Brachytherapy, radiation protection, radiation biology	• Brachytherapy • Treatment room shielding • Brachytherapy treatment planning • Radiation protection • Radiation biology
Patient safety, data transfer and integrity, professionalism and ethics	• Patient-specific treatment delivery QA • Quality control and error prevention • Incident learning systems and medical event reporting • Computing & IT • Professionalism and ethics