Initial Certification in Medical Physics

Part 1 Content Guide

PLEASE NOTE: List of Constants and Physical Values for Use on the Part 1 Physics Exam
The ABR provides candidates with a list of constants, physical values, and related information, which can be found on this page. While the list includes many constants and physical values, the ABR does not warrant the list as a compilation of all constants and physical values needed on the exams. Candidates should review the list carefully before their exams to familiarize themselves with the contents and list organization.

Content Guides

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.

Part 1: General Content Guide

- **Atomic / Nuclear Physics, Sources of Radiation, Interaction of Radiation with Matter**
  - Basic atomic and nuclear physics
  - Radioactivity
  - Sources of radioactive material
  - Radioactive material uses and safety
  - Radiation generating equipment: photons, electrons and heavy particles
  - Interactions of photon and particle radiation with matter
  - Dosimetry concepts and units
  - Spatial distribution/transmission of radiation (photons, protons and electrons

- **Radiation Instrumentation and Measurement**
  - Gas-filled detectors
  - Scintillation detectors
  - Solid state detectors
  - Neutron detectors
  - Emerging and miscellaneous detectors

- Measurement procedures
- Quality control and quality assurance
- Applications in imaging, nuclear radiology, therapy and safety

- **Diagnostic Medical Physics**
  - Radiography, Fluoroscopy and Mammography
  - Computed Tomography
  - Ultrasound
  - Magnetic Resonance
  - Modality comparison, image features and artifacts
  - Endogenous and exogenous contrast
  - Modality facility considerations, safety
  - Methods of quality control and quality assurance

- **Nuclear Medical Physics**
  - Scintillation cameras
  - Image acquisition and reconstruction
  - Common radionuclides
  - SNR, subject/image contrast
  - Spatial resolution
  - Mechanical aspects: accuracy, precision
  - Single Photon Emission Computed Tomography (SPECT)
  - Positron Emission Tomography (PET)
  - Modality comparison, image features and artifacts
  - Image processing and analysis
  - Applications, dose, facilities and safety
  - Hybrid imaging (SPECT/CT, PET/CT, PET/MR)
  - Methods of quality control and quality assurance
  - Counting principles
  - Physical, biological, and effective half-life

- **Therapeutic Medical Physics**
  - Clinical linear accelerator principles, collimation and mechanical aspects
  - Clinical kV and MV photon beam characteristics
  - Clinical megavoltage electron beam characteristics
  - Clinical proton beam characteristics
  - Comparison of clinical photon, electron and proton beams
  - Dose functions: PDD, TAR, TPR, TMR, SMR
  - Principles of radiation treatment planning
  - Basic dose (monitor unit) calculation
  - Brachytherapy
  - Radiation safety and protection, patients and personnel
  - Methods of quality control and quality assurance

- **Radiation Protection, Safety,** Professionalism and Ethics
  - Principles of radiation safety
  - Radiation risk and epidemiological data
  - Radiation protection regulations: NRC and Agreement States
  - Radiation areas
  - Regulatory exposure limits
  - Radiation protection program
  - Radioactive source management and security
  - Transportation of radioactive materials
  - Shielding design for diagnostic, nuclear radiology and therapeutic installations
  - Signage for diagnostic, nuclear radiology and therapeutic installations
  - Nonionizing radiation safety
  - Mechanical and electrical safety
  - Principles of quality assurance and quality control
  - Management of radiation accidents and large-scale radiological events
  - Professionalism and ethics

- **Mathematics – Statistics, Image Processing – Analysis, Informatics**
  - Mathematics relevant to medical physics
  - Statistics and biostatistics
  - Medical image analysis and processing
  - Observer performance and ROC analysis
  - Informatics

Part 1: Clinical Content Guide

- **Anatomy**
  - Breast
  - Cardiovascular
  - Digestive System
  - Musculoskeletal
  - Neurological System
  - Reproductive/Endocrine
  - Thoracic Cavity
  - Urinary System
  - Lymphatic System

- **Radiation Biology**
  - Physics and chemistry of radiation interactions with matter
  - Molecular and cellular radiobiology
  - Tumor radiotherapy
  - Normal tissue response to radiotherapy
  - Time dose fractionation
  - Radiobiological basis of radiation protection
  - Radiation accidents and environmental radiation exposure

- Diagnosis and medical management of radiation syndromes
- Deterministic effects
- Stochastic Effects
- Radiation carcinogenesis
- Heritable radiation effects
- Effects on the developingembryo

- **Human Physiology**
  - Nervous system
  - Musculoskeletal system consists ofthe
  - Cardiovascular system
  - Respiratory system
  - Digestive system
  - Integumentary system
  - Urinary system
  - Reproductive system
  - Immune system
  - Endocrine system

- **General Medical / Radiology / Radiation Therapy Terminology**
  - Medical Root Words
  - Diagnostic Radiology terminology
  - Radiation Therapy terminology

- **Clinical Procedure Applications**
  - Diagnostic Radiology
  - Radiation Therapy

- **Pathology**
  - Neoplastic Diseases
  - Benign Disease
  - Infectious Diseases
  - Congenital and hereditary diseases
  - Inflammatory
  - Trauma
  - Cardiovascular Diseases
  - Neurological