



**Maintenance of Certification**  
**Diagnostic Medical Physics 2015 Cognitive Exam Study Guide**  
**Updated 10/2016**

*The following is a general overview of the cognitive exam:*

**General Information**

Approximately 30% of the material on the examination is core diagnostic medical physics, technology, and safety. The remaining 70% is taken from recent advances in the field.

**Length and Structure**

The exam is approximately 150 questions in length. All questions are multiple-choice, and most have three to five possible answers. A standard calculator is available, but no complex calculations are required.

**Clinical Procedures**

Candidates should have a general knowledge of common diagnostic radiology procedures.

*The following items may be used to generate content for the exam:*

**Reports from the National Council on Radiation Protection (NCRP):**

NCRP Report No. 147: Structural Shielding Design for Medical X-Ray Imaging Facilities (2004 - Revised March 18, 2005)

NCRP Report No. 149: Mammography and Other Breast Imaging Methods (2004) NCRP

Report 160: Ionizing Radiation Exposure of the Population of the United States (2009)

NCRP Report 168: Radiation Dose Management for Fluoroscopically-Guided Interventional Medical Procedures (2010)

NCRP Report 172: Reference Levels and Achievable Doses in Medical and Dental Imaging: Recommendations for the United States (2012)

### **Reports from the American Association of Physicists in Medicine (AAPM):**

AAPM Report OR-03, Task Group #18: Assessment of Display Performance for Medical Imaging Systems (2005)

AAPM Report 93, Task Group #10: Acceptance Testing and Quality Control of Photostimulable Storage Phosphor Imaging Systems (2006)

AAPM Report 96, Task Group #23: The Measurement, Reporting, and Management of Radiation Dose in CT (2008)

AAPM Report 100, Task Group #1: Acceptance Testing and Quality Assurance Procedures for Magnetic Resonance Imaging Facilities (2010)

AAPM Report 108, Task Group #108: PET and PET/CT Shielding Requirements (2006) AAPM Report 116, Task Group #116: An exposure indicator for digital radiography (2009) (See also IEC report 62494-1)

AAPM Report 118, Task Group #118: Parallel Imaging in MRI, Technology, Applications and Quality Control

AAPM Report 125, Task Group #125: Functionality and Operation of Fluoroscopic Automatic Brightness Control/Automatic Dose Rate Control Logic in Modern Cardiovascular and Interventional Angiography Systems (2012)

AAPM Report 204, Task Group #204: Size-Specific Dose Estimates (SSDE) in Pediatric and Adult Body CT Examinations (2011)

AAPM Report 223, Task Group #223: Radiation dosimetry in digital breast tomosynthesis: Report of AAPM Tomosynthesis Subcommittee Task Group 223. *Medical Physics* (2014) 41: 091501-1-10

### **Reports from the American College of Radiology (ACR):**

ACR–AAPM–SIIM Practice Guideline for Digital Radiography Res. 37 – 2012

ACR–AAPM–SIIM Practice Guideline for Determinants of Image Quality in Digital Mammography Res. 36 – 2012

ACR CT Accreditation Program Website for Testing and QC Forms:  
[http://www.acr.org/accreditation/computed/qc\\_forms.aspx](http://www.acr.org/accreditation/computed/qc_forms.aspx)

ACR US Accreditation Program Website:  
[http://www.acr.org/accreditation/ultrasound/ultrasound\\_reqs.aspx](http://www.acr.org/accreditation/ultrasound/ultrasound_reqs.aspx)

ACR MRI Accreditation Program Website for Testing and QC Forms:  
[http://www.acr.org/accreditation/mri/mri\\_qc\\_forms.aspx](http://www.acr.org/accreditation/mri/mri_qc_forms.aspx)

ACR Mammography Accreditation Program Website

ACR Appropriate Use Criteria Overview

ACR-SNM Technical Standard for Diagnostic Procedures Using Radiopharmaceuticals

ACR Technical Standard for Diagnostic Medical Physics Performance Monitoring of  
Ultrasound Equipment

<http://www.acr.org/~media/ACR/Documents/PGTS/standards/MonitorUSEquipment.pdf>

**Journal articles:**

E Kanal, et al., ACR Guidance Document on MR Safe Practices: 2013. *Journal of Magnetic Resonance Imaging* 2013; 37:501-530.

EL Nickoloff, AAPM/RSNA Physics Tutorial for Residents: Physics of Flat-Panel Fluoroscopy Systems. *RadioGraphics* 2011; 31:591-602

N Hangiandreou, AAPM/RSNA Physics Tutorial for Residents: Topics in US. *RadioGraphics* 2003;23(4).

JL Gennisson, Ultrasound elastography: principles and techniques. *Diagn Interv Imaging* 2013; 94(5)

V Kapoor, et al., An introduction to PET-CT imaging. *RadioGraphics* 2004;24(2):523-43.

JN Morelli, et al., An Image-based Approach to Understanding the Physics of MR Artifacts. *RadioGraphics* 2011; 31:849-866.

F Mettler, et al., Effective doses in radiology and diagnostic nuclear medicine: a catalog. *Radiology* 2008;248(1):254-63.

LW Goldman, Principles of CT and CT technology. *J Nucl Med Technol* 2007; 35(3): 115-28

**Additional references:**

Health Effects from Exposure to Low Levels of Ionizing Radiation (BEIR VII Phase 2) (The National Academies Press, 2006). (Public Summary, Executive Summary and Glossary)

*The Essential Physics of Medical Imaging*, Jerrold Bushberg, J. Anthony Seibert, Edwin Leidholdt Jr., John Boone (2011)

*Medical Imaging Physics* William Hendee, E. Russell Ritenour (2007)

*MDCT Physics: The Basics: Technology, Image Quality and Radiation Dose*, Mahadevappa Mahesh

ICRP Report 103: The 2007 Recommendations of the International Commission on Radiological Protection (2007)

Joint Commission: [www.jointcommission.org](http://www.jointcommission.org)

Code of Federal Regulations: 21 CFR 20

Food and Drug Administration: [www.FDA.gov](http://www.FDA.gov)

Mammography Quality Standards Act

## Sample Questions

1. What is the definition of weekly workload (W) of a medical x-ray imaging tube?
  - A. Time integral of tube current
  - B. Product of the time an x-ray beam is pointed at a barrier and the x-ray tube current
  - C. Average number of patients examined in a radiographic suite
  - D. Product of the average number of patients examined in a radiographic suite

Key = A

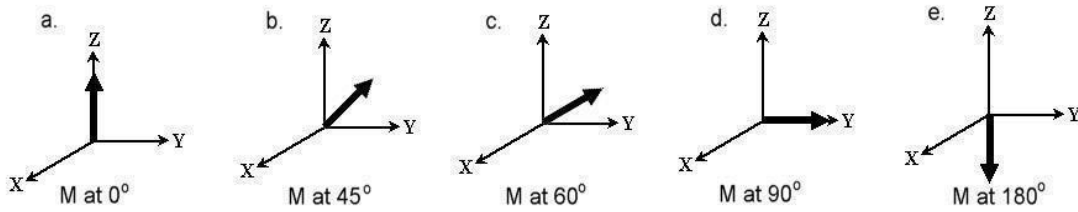
2. For an abdominal CT exam performed on a 52-year-old patient, the  $CTDI_{vol} = 22$  mGy, and the size-specific dose estimate (SSDE) = 18.7 mGy. What is the approximate diameter of the patient's abdomen?
  - A. 16 cm
  - B. 24 cm
  - C. 32 cm
  - D. 40 cm

Key = D

3. According to the American Association of Physicists in Medicine (AAPM) report number 70, for an II fluoro system, what is the achievable measured spatial resolution for a 15-cm field of view?
  - A. 1.0 – 1.2 lp/mm
  - B. 2.2 – 2.5 lp/mm
  - C. 4.5 – 5.0 lp/mm
  - D. 6.0 – 8.0 lp/mm
  - E. 10 – 12 lp/mm

Key = B

4. Of the following diagrams showing the net magnetization ( $M$ ) of the spin system, which represents saturation? ( $B_0$  is in the  $z$  direction.)



Key = D

5. In the diagnostic x-ray energy range, what is the total linear attenuation coefficient?
- A. Product of Compton, photoelectric, and coherent linear attenuation coefficients
  - B. Sum of Compton, photoelectric, and coherent linear attenuation coefficients
  - C. Photoelectric linear attenuation coefficient only

Key = B