

Diagnostic Medical Physics 2011 Cognitive Exam Study Guide

Updated 5/2011

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 100 questions in length. All questions are multiple-choice, and most have four or 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)

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

AAPM Report No. 70: Cardiac Catheterization Equipment Performance (2001)

AAPM Report No. 74: Quality Control in Diagnostic Radiology (2002)

AAPM Report No. 77: (NMR TG #8 Report): Practical Aspects of fMRI (2002)

AAPM Report No. 93: Acceptance Testing and Quality Control of Photostimulable Storage Phosphor Imaging Systems (2006)

Reports from the American College of Radiology (ACR):

ACR Technical Standards for Diagnostic Medical Physicists: Performance Monitoring of Real Time Ultrasound Equipment (2006)

Journal articles:

Amis ES, et al. ACR white paper on radiation dose in medicine. *Journal of the American College of Radiology* 2007;4:272-284.

Kanal E, et al. ACR Guidance Document on MR Safe Practices: 2007. *American Journal of Roentgenology* 2007; 188:1-27.

McNitt-Gray MF. AAPM/RSNA physics tutorial for residents: topics in CT. radiation dose in CT. *Radiographics* 2002;22:1541-1553.

V Kapoor, et.al. An introduction to PET-CT imaging. *Radiographics* 2004;24:523-543.

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)

ACR CT Accreditation Program Website for Testing and QC Forms:

http://www.acr.org/accreditation/computed/qc_forms.aspx

ACR US Accreditation Program Website:

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

Image Gently Download Library Protocols for Professionals: Pediatric CT Protocol Guidance and Worksheet:

<http://www.pedrad.org/associations/5364/files/Protocols.pdf>

Image Gently Download Library Protocols for Professionals: Interventional Procedures: Step Lightly Procedure Checklist, available from:

<http://www.pedrad.org/associations/5364/ig/index.cfm?page=596>

Image Gently Download Library Protocols for Professionals: Interventional Procedures: Suggested Protocol for Radiation Safety in Pediatric IR:

<http://www.pedrad.org/associations/5364/ig/index.cfm?page=597>

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. Which of the following statements is true regarding CT dose?

- A. Using the same scanning techniques, the $CTDI_w$ for the standard 16-cm acrylic CTDI phantom is less than for the standard 32-cm acrylic CTDI phantom.
- B. The $CTDI_{100,center}$ is about half of the $CTDI_{100,periphery}$ for the standard 16-cm acrylic CTDI phantom
- C. The $CTDI_{100,center}$ is greater than the $CTDI_{100,periphery}$ for the standard 32-cm acrylic CTDI phantom.
- D. Commonly-used methods for estimating effective dose in CT are patient-specific.
- E. For typically-used clinical scanning techniques, the effective dose for a scan of the head is less than for a scan of the chest.

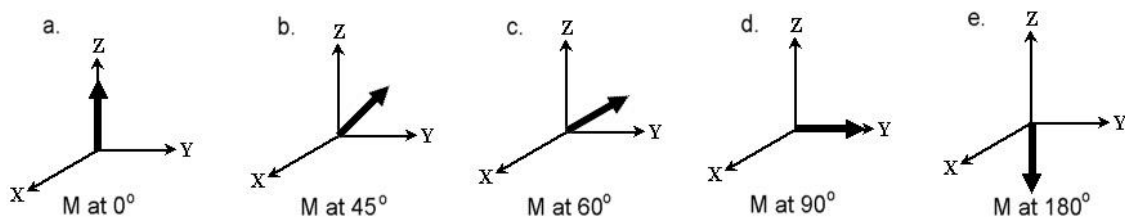
Key = E

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