



AMERICAN
BOARD OF
RADIOLOGY

Initial Certification Diagnostic Medical Physics (DMP)

Part 2 Content Guide and Sample Questions

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PLEASE NOTE: List of Constants and Physical Values for Use on the Part 2 Physics Exams

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 examinations. Candidates should review the list carefully before their examinations to familiarize themselves with the contents and list organization. Please note that although constants are provided, equations are not typically provided.

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.

1. **Radiography, Mammography, Fluoroscopy, and Interventional Imaging**

- X-ray imaging physics
- Radiography
- Mammography
- Fluoroscopy and Interventional Radiology

- Clinical Medical Physics Practice (radiography, mammography, fluoroscopy)
2. **Computed Tomography**
 - CT Design and Fundamentals of Operation
 - CT Clinical protocols and procedures
 - CT Image Quality
 - CT Radiation Dose and Patient Safety
 - CT Clinical Medical Physics Practice
 3. **MRI and Ultrasound**
 - Magnetic Resonance Imaging and Spectroscopy Basic Physics
 - MR Imaging procedures and Safety considerations
 - Ultrasound basic physics, interactions, production and beam properties
 - Ultrasound data acquisition, image characteristics and safety
 - MRI and US Clinical Medical Physics Practice
 4. **Informatics, image display, and image fundamentals**
 - Information Systems Design and Fundamentals of Operation
 - Image Display and Workstation
 - Modality Image Characteristics
 - Imaging Fundamentals
 - [Professionalism and Ethics](#) – Clinical Medical Physics Practice
 5. **Radiation Biology, Dosimetry, Protection, and Safety**
 - Radiation Biology
 - Dosimetry Fundamentals
 - Radiation Protection
 - Radiation Safety
 - Room Shielding Design

Sample Questions

Simple Questions

(includes new item types)

1. For a radiograph acquired with automatic exposure control, an increase in which of the following factors will increase patient skin dose?
 - A. Tube current (mA)
 - B. Tube voltage (kV)
 - C. Patient thickness
 - D. Focal spot size
 - E. Source-to-image distance

2. A region of interest (ROI) in a CT image has an intensity of -30 HU. What is the ratio of the linear attenuation coefficient for the ROI to that of water?
- A. 0.70
 - B. 0.97
 - C. 1.00
 - D. 1.03
 - E. 1.30
3. As a potential contrast agent for ultrasound, which of the following materials is expected to be the strongest scatterer for a fixed concentration of small ($< 5 \mu\text{m}$) particles?
- A. Encapsulated polymer
 - B. Encapsulated lipid
 - C. Encapsulated gas
 - D. Encapsulated iodine
4. Which one of the following objects will have the highest MR signal in a brain image acquired with a spin echo pulse sequence of $\text{TR}=2500 \text{ ms}$ and $\text{TE}=100 \text{ ms}$?
- A. Gray matter
 - B. White matter
 - C. Lens of the eye
 - D. Cerebrospinal fluid
5. According to NCRP Report No. 116, what is the annual occupational equivalent dose limit for an extremity?
- A. 0.5 Sv
 - B. 1.5 Sv
 - C. 5 Sv
 - D. 15 Sv
 - E. 50 Sv

Answers for this section:

- 1. C
- 2. B
- 3. C
- 4. D
- 5. A

New Item Types

Fill-in-the-blank

The candidate must type in the correct response:

1. According to MQSA regulations, the calculated average glandular dose to the ACR phantom for a single craniocaudal view must be less than _____ mGy.

Answer = 3

Point-and-click

1. Point and click on the x-ray tube.



Answer: Clicking any place inside the yellow box is correct.

R-Type

Lead-in:

The following is a list of components of an image intensifier fluoroscopy system. The system has three magnification modes: 23 cm, 15 cm, and 12 cm. Identify the component that is the best answer for each question. Each option may be used once, more than once, or not at all.

1. Which major component of an image intensifier system has the smallest physical size?

- A. Input phosphor
- B. Photo cathode
- C. Focusing electrodes
- D. Magnetic shielding
- E. Output phosphor
- F. Charge-coupled device array (2k × 2k)
- G. Flat panel monitor (1k × 1k)

2. Which component is held at the most negative electric potential?

- A. Input phosphor
- B. Photo cathode
- C. Focusing electrodes
- D. Magnetic shielding
- E. Output phosphor
- F. Charge-coupled device array (2k × 2k)
- G. Flat panel monitor (1k × 1k)

3. Which component is used to minimize S-distortion?

- A. Input phosphor
- B. Photo cathode
- C. Focusing electrodes
- D. Magnetic shielding
- E. Output phosphor
- F. Charge-coupled device array (2k × 2k)
- G. Flat-panel monitor (1k × 1k)

4. Which component determines the limiting spatial resolution in normal (23 cm) mode?

- A. Input phosphor
- B. Photo cathode
- C. Focusing electrodes
- D. Magnetic shielding
- E. Output phosphor
- F. Charge-coupled device array (2k × 2k)
- G. Flat panel monitor (1k × 1k)

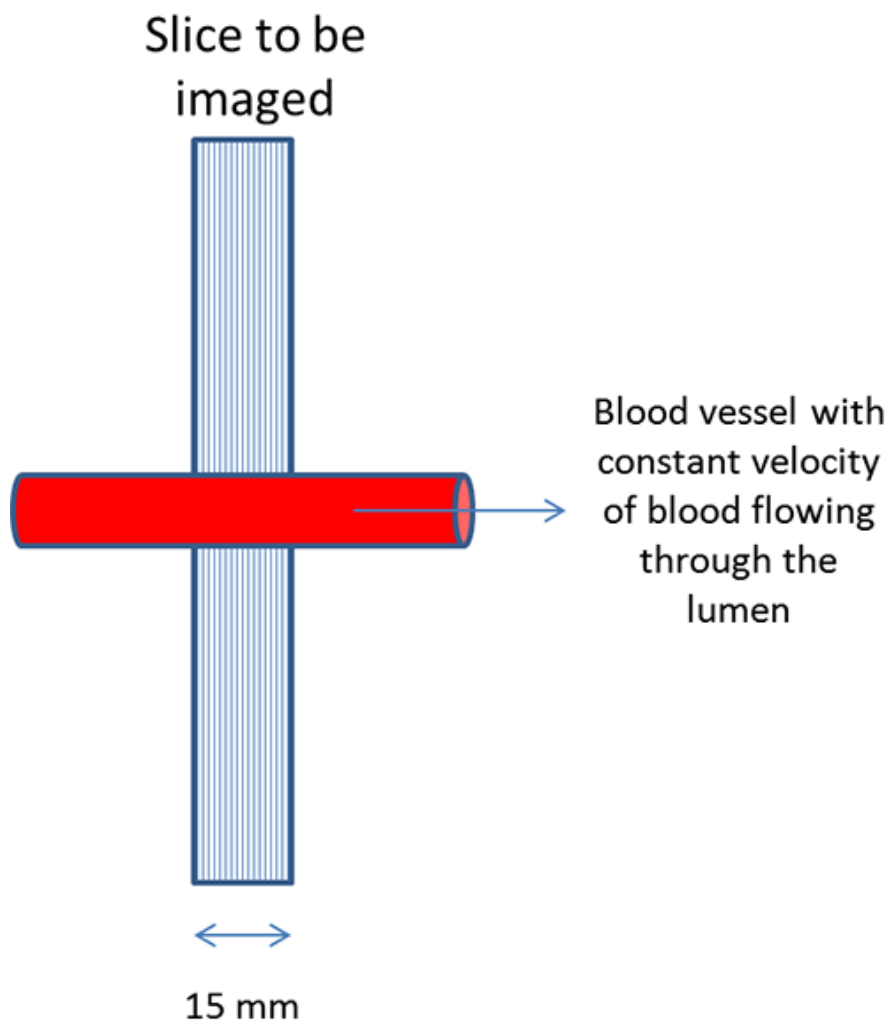
Answers:

1. F
2. B
3. D
4. G

Case-based Items

NOTE: The candidate will not be able to return to the previous question to change his or her answer:

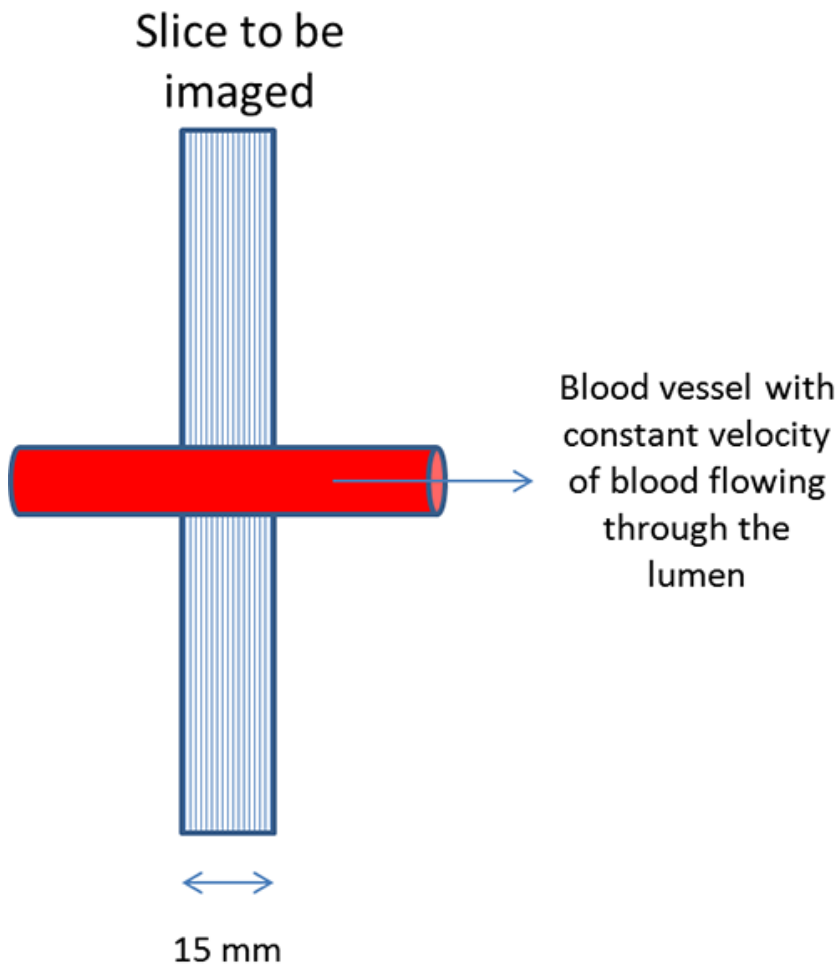
1. A 15-mm-thick slice is imaged using a conventional spin-echo pulse sequence with a TE of 100 ms and a TR of 2500 ms. How long after the excitation pulse is the 180 degree refocusing pulse applied?



- A. 50 ms
- B. 100 ms
- C. 500 ms
- D. 1000 ms
- E. 1250 ms

BLOCK: After you move to the next question, you will be unable to go back to change your answer.

2. A 15-mm-thick slice is imaged using a conventional spin-echo pulse sequence. The refocusing pulse is applied at 50 ms after the excitation pulse. What is the minimum velocity of the blood in the lumen of the vessel so that a flow void is observed on the corresponding image?



- A. 100 mm/s
- B. 300 mm/s
- C. 500 mm/s
- D. 700 mm/s

Answers:

- 1. A
- 2. B