Initial Certification
Nuclear Medical Physics (NMP)
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.

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. **Radiation Protection, Safety, Professionalism and Ethics**
    - Internal dosimetry
    - Dose terminology and Definitions
    - Dose Regulations
    - Expected doses
    - Fetal Dosimetry
    - CT dosimetry
    - Occupational safety
    - Safety for the patient, family and public

- Time, distance shielding
- Shielding calculations
- Professionalism and Ethics

2. **PET & Hybrid**
   - Basic PET scanner Instrumentation
   - Radionuclide production and characteristics
   - PET Detectors
   - Acquisition
   - Reconstruction
   - Corrections (Attenuation, random, scatter)
   - Quantitative PET
   - PET/CT
   - QC procedures
   - Acceptance/Annual testing

3. **Single photon imaging systems including scintillation cameras, solid state cameras and hybrids**
   - Basic system instrumentation
   - Radionuclide production and characteristics
   - Intrinsic Specifications
   - Extrinsic Specifications
   - Collimation
   - Digital Systems
   - Dynamic imaging
   - SPECT
   - SPECT/CT
   - QC procedures
   - Acceptance/Annual testing

4. **Radiation measurements including dose calibrators, well counters, survey meters, thyroid probes**
   - Scintillation detector system
   - Solid State Detectors
   - Well Counters and Probes
   - Survey Meters
   - Dose Calibrator
   - Dead-time
   - Efficiency
   - Operation of SCA, MCA
   - Statistical distributions
   - Statistical Tests
   - Propagation of Errors
   - Digital Image Statistics
   - Chi-Square Tests
   - Minimum detectable activity
   - Quantitative measurements including calibration

- Quality Control

5. **Clinical Procedures**
   - Cardiac
   - Pulmonary
   - Tumor Imaging
   - Bone Imaging
   - Brain
   - Endocrine (Thyroid)
   - Lymphatic
   - Radionuclide therapy
   - Brachytherapy
   - Other

Sample Questions

Simple Questions

(includes new item types)

1. How are ^{201}TI and ^{123}I produced?

   A. In fission by-products
   B. In particle accelerators
   C. In radionuclide generators
   D. In neutron activation

2. A spatial resolution measurement of a SPECT system is performed using line sources of ^{99m}Tc according to the NEMA protocol. If the spatial resolution (FWHM) is 10.5 mm in the center of the phantom, what is the peripheral tangential spatial resolution (FWHM) at 7.5 cm from the center of the phantom?

   A. 8 mm
   B. 12 mm
   C. 14 mm
   D. 16 mm

3. What is the effect of increasing an image matrix from 128 x 128 to 256 x 256?

   A. Improved contrast
   B. Improved resolution
   C. Improved signal-to-noise ratio
   D. Decreased noise

4. If the minimum, mean, and maximum pixel counts in the central field of view of a smoothed intrinsic flood image are 4500, 5200, and 5500, respectively, what is the integral uniformity?
   A. 5%
   B. 6%

C. 10%
D. 14%
E. 15%

5. In a gate-synchronized ventricular function study, the color-coded phase image shows a group of pixels in the apex of the left ventricle displayed in the hue assigned to the atria. What is the most likely explanation for this observation?

   A. Global left ventricular hypokinesis
   B. Valvular insufficiency
   C. Malfunctioning software
   D. Cardiac arrhythmia
   E. Apical dyskinesis

Answers for this section:

1. B
2. A
3. B
4. C
5. E

New Item Types:

Fill-in-the-Blank

The candidate must type in the correct response:

1. If the field of view of a scintillation camera is 20 cm and the matrix is 128 × 128, what is the pixel size of the image? _____mm (Round to two decimal places.)

Answer: 1.56, (1.54, 1.55, 1.56, 1.57, and 1.58 will also be accepted.)

R-Type

Lead-in:

1. For each question, choose the correct radiopharmaceutical from the drop-down list. Each option can be used once, more than once, or not at all. Please advance to the next screen.
   A. ^{111}In leukocytes
   B. ^{111}In pentetate (DTPA)
   C. ^{123}I ioflupane
   D. ^{123}I NaI
   E. ^{99m}Tc MAA
   F. ^{99m}Tc MDP
   G. ^{99m}Tc sestamibi
2.

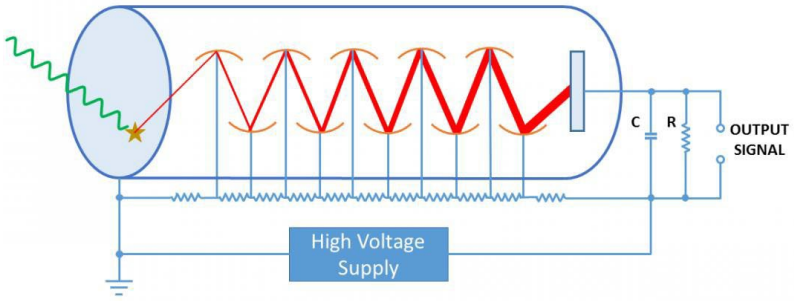
A. This radiopharmaceutical is used primarily for the diagnosis of infection.
B. This radiopharmaceutical is used primarily for the diagnosis of thyroid function.
C. This radiopharmaceutical is used primarily for the diagnosis of pulmonary embolism.

Answer:

1. A
2. D
3. E

Point-and-Click

1. The figure shows a common device employed in nuclear radiology instrumentation. Point and click on the cathode.



Answer: The candidate can click anywhere within the yellow oval.