NUCLEAR MEDICAL PHYSICS CONTINUING CERTIFICATION EXAM CONTENT GUIDE

1. Radiation Protection, Safety, Professionalism and Ethics
   - Internal dosimetry
   - 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
   - Basics of 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
   - 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**

**Multiple Choice**

1. How are $^{201}$Tl 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

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 x 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.)