



**"CT WAIVER Course for the Nuclear Medicine Technologist"**  
**Course Control Document**  
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This online self-study course is required by technologists who are operating a PET/CT Scanner for the purpose of performing attenuation correction only with the CT scanner. The technologist has also met the requirement for device-specific training needed to perform the CT portion of a PET-CT examination described under s. 468.302(3)(g), FS. This course covers the following subjects concerning PET and CT: Cellular Effects of Radiation, Effects of Initial and Late Exposures to Radiation, Protection of Personnel, Measuring Patient doses from CT procedures, Radiation Safety in PET Imaging, CT Physics and Instrumentation, Acquisition Processing and Display of CT Images, Integration of CT Images into the fused PET/CT study, PET Instrumentation, Acquisition, Processing and Display of PET Images, PET Quality Control, and Troubleshooting Image Artifacts. This course has been approved by the ARRT, SNMITS, Florida Bureau of Radiation Control, and various Accreditation Agencies.

**TOPIC: Pretest**

**TOPIC: 028611 Cellular Effects of Radiation**

**Objectives:**

**90min.**

1. Inspect the direct and indirect effects of radiation.
2. Evaluate the radiolysis of water.
3. Analyze the types of dose-response relationships.
4. Discuss target theory.
5. Explain Cell survival curves.
6. QUIZ I:

**TOPIC: 028612 Effects of Initial Exposure to Radiation.**

**Objectives:**

**90min.**

1. Discuss the hematological, gastrointestinal, and central nervous system syndromes.
2. Describe the local tissue damage to the skin, eyes and gonads.
3. Explain hematologic and cytogenetic effects.
4. QUIZ II:

TOPIC: 028613 **Effects of Long-Term Exposure to Radiation.**

Objectives: 90min.

1. Discuss epidemiology.
2. Examine Risk Estimation Models.
3. Examine Radiation Induced malignancies.
4. Identify life span shortening.
5. Discuss genetic damage.
6. Explain irradiation of the fetus.
7. Analyze stochastic and non-stochastic effects.
8. QUIZ III

TOPIC: 028614 **Protection of Personnel**

Objectives: 90min.

1. Discuss the rationale for radiation protection.
2. Explain personnel dosimeters, dosimetry reports, and duties of the RSO.
3. Define and calculate the dose-limiting recommendations for PET/CT personnel.
4. Explain the basic structural shielding construction and list the items that influence this construction.
5. Describe how the PET/CT Technologist can decrease their radiation exposure during the patient preparation and scanning sequences.
6. Discuss how using distance can decrease radiation exposure.
7. Illustrate the Inverse Square Law.
8. Identify garments that can be worn to reduce radiation exposure and explain how each garment should be used.
9. QUIZ IV:

TOPIC: 028615 **Measuring Patient Dose from Computed Tomography Scanners.**

Objectives: 90min.

1. Discuss CT Scanner X-Ray Beam Geometry
2. Explain Methods of Measuring Patient Dose.
3. Describe Multiple Scan Average Dose curves.
4. Define CT Dose Index.
5. Measuring the CT Dose Index.

6. Discuss Spiral/Helical CT Scanner Dosimetry.
7. Explain methods for reducing the patient dose from the CT Scanner.
8. Illustrate dosimetry survey of CT Scanners.
9. QUIZ V:

TOPIC: 028616 **Radiation Safety in PET Imaging**

Objectives: 90min.

1. Review cautions signs and labels.
2. Discuss the Do's and Don'ts in PET Radiation protection.
3. Examine the Receiving and Monitoring of Radioactive packages.
4. Discuss Radioactive waste disposal.
5. Explain how to clean up a radioactive spill.
6. Discuss recordkeeping principles.
7. QUIZ VI:

TOPIC: 028617 **CT Physics and Instrumentation.**

Objectives: 90min.

1. Describe the physics of processes involved in the production of X-rays.
2. Describe the role of each component in the X-ray tube and its operation.
3. Discuss the proper adjustment of X-ray tube voltage and mA current settings in CT.
4. Name the principal parts of the CT Scanner.
5. Describe the function of each CT Scanner component.
6. Describe how a Helical CT scanner operates and the component changes that made this technology possible.
7. QUIZ VII:

TOPIC: 028618 **Acquisition, Processing, and Display of CT Images.**

Objectives: 90min.

1. Discuss how CT image data are acquired and processed.
2. Describe the calculation process of Hounsfield units.
3. Describe CT numbers values assigned to various tissues and how these values are assigned into meaningful display windowing.
4. List the parameters set by the operator for CT use and describe the effect of each on the images.
5. QUIZ VIII:

TOPIC: 028619 **Overview of CT Quality Control Procedures**

Objectives: 90min.

1. Identifying the quality control parameter for QC measurements.
2. Discussing the frequency of test requirements.
3. Examining the limits of a "Passing" Test.
4. Determining the Average CT Number of Water.
5. Evaluating the Standard Deviation of CT Number in Water.
6. Discussing High Contrast Resolution testing in CT.
7. Evaluating a Low Contrast Resolution Phantom.
8. Determining the Accuracy of Distance Measuring Device.
9. Recognizing the Distortion of Video monitors.
10. Discussing the Distortion of Film Images or Other Hard Copy Output
11. Determining the causes of a Flat CT Number.
12. Evaluating the Hard Copy Output.
13. Discuss the Accuracy of Localization Devices.
14. Discussing the quality control procedure for Bed Indexing.
15. Determination of Light Field Accuracy.
16. Evaluation of Slice Width.
17. Discuss CT Number versus Patient Position.
18. Explain CT Number versus Patient Size.
19. Discuss CT Number versus Algorithms
20. Examine CT Number versus Slice Width
21. Identify Noise Characteristics.
22. Recognize Radiation Scatter and leakage.
23. QUIZ IX:

TOPIC: 028620 **An Overview of the Integration of CT Procedures into the combined PET/CT examination**

Objectives: 90min.

1. Discuss the use of Oral and IV Contrast Agents.
2. Discuss the IV Pressure Injector for angiographic studies.
3. Evaluate the use of Timing Bolus's.
4. Review contrast agents adverse reactions.
5. QUIZ X:

TOPIC: 028621 **PET Instrumentation**

Objectives: 90 min.

1. List detector crystals that can be used for PET Imaging and describe their properties.
2. Explain the fundamental operation of dedicated and Hybrid PET Scanners and their design.
3. Describe the detection of True, Scatter, and random events.
4. Describe Transmission imaging and its need and use in attenuation corrected images.

5. Characterize the visual presentation of non-attenuated and attenuated corrected images.
6. QUIZ XI:

TOPIC:028622 **Acquisition, Processing, and Display of PET Images.**

Objectives: 90min.

1. Discuss 2D and 3D acquisition protocols.
2. Discuss scan protocol parameters.
3. Review Whole-Body versus Total Body acquisition modes.
4. Discuss Dynamic Acquisition modes.
5. Define SUV and explain how it is calculated and used.
6. Discuss critical elements in generating quantitative measurements.
7. Describe the process of data reconstruction.
8. Discuss the implications of image fusion and describe the PET/CT Scanner.
9. QUIZ XII:

TOPIC:028623 **An Overview of PET Quality Control Procedures.**

Objectives: 90 min.

1. Discuss the daily quality control procedures performed on a Hybrid PET/CT Scanner.
2. Discuss the frequency of PET/CT Quality Control Procedures.
3. Analyze a typical Blank Scan.
4. Discuss Blank Scans.
5. Discuss Coincidence Timing Circuitry.
6. Review Singles.
7. Discuss Normalization
8. Discuss Well Counter Calibration.
9. QUIZ XIII:

TOPIC: 028624 **Troubleshooting Image Artifacts in PET/CT.**

Objectives: 90min.

1. Identify misregistration artifacts.
2. Review Patient Motion Artifacts.
3. Discuss Beam Hardening Artifacts.
4. Identify Contrast Material Artifacts.

5. Discuss Partial Volume Averaging Artifacts.
6. Review Equipment induced Artifacts.
7. Analyze Metal Artifacts.
8. Identify Ring Artifacts.
9. QUIZ IX

TOPIC: **Post-Test**

TOPIC: **Course Survey Evaluation**

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