Course Control Document

The PET / CT Training Institute

45 Hour PET Alternative Eligibility Course

Module I Week I Quiz I  2003A: RADIOPHARMACY

9:00PM   Welcome/Syllabus Review        10 min.
9:10PM    Pretest 2003A                 20 min.
9:30PM    TOPIC: Lecture: Basic Math Skills for Nuclear Medicine Technologist I.

Objectives: 90 min.

1. Explain how to use the Texas Instruments 30 (x) II A Calculator.
2. Demonstrate how to solve the following math problems with the calculator.
   - Radioactive Decay using half-lives
   - Pre-Calibrations
   - Specific Concentrations

11:00PM Session Completed

Module I Week I Quiz II 2003A: RADIOPHARMACY

9:00PM   Lecture: Basic Math Skills for the Nuclear Medicine Technologist II.

Objectives: 120 min.

1. Explain how to solve the following math problems with the calculator.
   - Dose Volume Calculations
   - Effective Half-life
   - Radiation Dose versus time
   - Radiation Dose versus distance from source
• Half Value Layers
• Units of Activity, Exposure, and Absorption

11:00PM Session Completed

**Module I Week I Exam 2003A:**
9:00PM: TOPIC: Exam Reviewed
11:00PM Session completed

**Module I Week II Quiz I 2003A: RADIOPHARMACY**
9:00PM TOPIC: *Production of Radionuclides* 120 min.

Objectives:

1. Discuss nuclear stability and its relationship to radioactive decay.
2. Describe the basic mechanisms for radionuclide production in a reactor.
3. Describe the fundamentals of particle accelerator operations and the production of radionuclides using particle accelerators.
4. Describe generator kinetics in the production of radionuclides, and detail the difference between transient and secular equilibrium.

11:00PM Session completed

**Module I Week II Quiz II 2003A: RADIOPHARMACY**
9:00PM TOPIC: *PET Radiopharmaceuticals* 120 min.

Objectives:
1. List and describe the properties of PET Radiopharmaceuticals.
2. Discuss Fluorine 18 PET Radiopharmaceuticals.
3. Discuss Carbon 11 PET Radiopharmaceuticals.
4. Discuss Oxygen 15 PET Radiopharmaceuticals.
5. Discuss Nitrogen 13 PET Radiopharmaceuticals.

Module I Week II Exam 2003A: RADIOPHARMACY

9:00PM Exam Reviewed

Module I Week III Quiz I 2003A: RADIOPHARMACY

9:00PM TOPIC: Radiopharmaceutical Quality Control

Objectives: 120 min.

1. Describe the difference between quality control relative to radionuclide purity, radiochemical purity, and chemical impurities.
2. Discuss the difference between sterile compounds and compounds containing pyrogens, and test for ensuring these properties.

Module I Week III Quiz II 2003A: RADIOPHARMACY

9:00PM TOPIC: The Nuclear Pharmacy

Objectives: 120 min.

1. Discuss the Hot Lab Floor Plan.
2. Identify the restricted areas.
3. Discuss radioactive storage and shielding requirements.
4. Discuss the work surfaces and sinks.
5. Review the required records.
6. Discuss the Unit Dose Manager.

11:00 Session completed

Module I Week III Exam 2003A: RADIOPHARMACY

9:00PM Exam Reviewed

11:00 Session completed

Module I Week IV Quiz I 2003A: RADIOPHARMACY

9:00PM TOPIC:  **Radioactive Receipt**

Objectives:  

1. Discuss how to perform a wipe test on incoming shipments.
2. Discuss how to perform a survey of an incoming shipment of radioactive materials.

11:00PM Session completed.

Module I Week IV Quiz II 2003A: RADIOPHARMACY

9:00PM TOPIC:  **Radioactive Disposal**

Objectives:

1. Discuss CFR 20: Decay in storage
2. Discuss Regulatory Issues related to dispensing of radioactive materials 10 CFR 49.

3. Discuss daily radiation surveys.

11:00PM Session completed

**Module I Week IV Exam 2003A: RADIOPHARMACY**

9:00 TOPIC: FINAL EXAM and POST TEST

11:00 Session Completed

**Module II Week I Quiz I 2003B: RADIATION SAFETY**

9:00PM TOPIC: **Syllabus Review/Pre-Test**

Objective: 30 min.

1. Review the syllabus to Radiation Safety and Radiobiology.
2. Complete Pre-Test for 2003B

9:30PM TOPIC: Lecture: **The History of Radiobiology**

Objectives: 90 min.

1. Discuss the Law of Bergonie and Tribondeau
2. Review Fractionation Theory
3. Discuss Mutagenesis effects of radiation exposure.
4. Discuss the Effects of Oxygen as a radio-sensitizer.
5. Discuss the Law of Bergonie and Tribondeau
6. Discuss Fractionation Theory
7. Discuss Effects of Radiation on Reproductive Failure
Module II Week I Quiz II 2003B RADIATION SAFETY

9:00PM: TOPIC: Lecture: Cellular Anatomy and Physiology

Objectives: 120 min.

1. Indicate parts of the cell
2. Identify organic compounds and their functions
3. Identify inorganic compounds and their functions
4. Explain Mitosis
5. Explain Meiosis

Module II Week I Exam

9:00PM TOPIC: Exam Reviewed

11:00PM Session completed

Module II Week II Quiz I 2003B RADIATION SAFETY

9:00PM TOPIC Lecture: Cellular Effects of Radiation

Objectives: 120 min.

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.

11:00PM Session completed

Module II Week II Quiz II 2003B RADIATION SAFETY
9:00PM TOPIC: Lecture: **Effects of Initial Exposure to Radiation.**

Objectives: **120 min.**

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.

11:00PM Session completed

**Module II Week II Exam 2003B RADIATION SAFETY**

9:00PM TOPIC: Exam Reviewed

11:00 Session completed

**Module II Week III Quiz I 2003B RADIATION SAFETY**

9:00PM TOPIC: Lecture: **Effects of Long-Term Exposure to Radiation**

Objectives: **120 min.**

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.

11:00PM Session completed

**Module II Week III Quiz II 2003B RADIATION SAFETY**

9:00PM TOPIC: Lectures: **Radiation Protection of Personnel**
Objectives: 120 min.

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.

11:00PM Session completed

**Module II Week III Exam 2003B RADIATION SAFETY**

9:00PM TOPIC: Exam Reviewed

11:00PM Session completed

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**Module II Week IV Quiz I 2003B RADIATION SAFETY**

9:00PM TOPIC: Quiz Review: *Measuring Patient Dose from Computerized Tomography Scanners.*

Objectives: 120 min.

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.

11:00PM Session completed

**Module II Week IV Quiz II 2003B RADIATION SAFETY**

9:00PM TOPIC: Quiz Review: **Radiation Safety in PET Imaging**

Objectives: 120 min. 90min.

1. Review cautions signs and labels.
2. Discuss the Do’s and Don’ts in PET Radiation protection.
3. Explain how to clean up a radioactive spill.

11:00PM Session completed

**Module II Week IV Exam 2003B RADIATION SAFETY**

9:00PM TOPIC: Exam Reviewed / Post Test

11:00 Session completed

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**Module III Week I Quiz I  2003C: INSTRUMENTATION**

9:00PM TOPIC: Syllabus Review/ Pre-Test 30 min.

9:30PM TOPIC: Lecture: **Introduction to Survey Meters** 90 min.

Objectives:

1. Describe the construction and operating principles of gas filled detectors, to include the GM Survey Meter and ionization detectors.
2. Describe the Quality Control requirements to maintain compliance for a Survey meter.

3. Demonstrate how to use a Survey Meter.

4. Describe how to read the Survey Meter.

5. Describe Constancy procedures.

6. Discuss battery checks.

11:00PM Session completed

**Module III Week I Quiz II 2003C: INSTRUMENTATION**

9:00PM TOPIC: Lecture: **Introduction to Dose Calibrators**

Objectives: 120 min.

1. Describe the construction and operating principles of a Dose Calibrator.

2. Describe the Quality Control requirements to maintain compliance.

3. Discuss Constancy procedures.

4. Discuss Accuracy procedures.

5. Discuss Linearity procedures.

6. Discuss Geometric Variations procedures.

11:00PM Session completed

**Module III Week I Exam 2003C: INSTRUMENTATION**

9:00PM Exam Reviewed
11:00PM Session completed

**Module III Week II Quiz I 2003C: INSTRUMENTATION**

9:00PM TOPIC: Lecture: *Introduction to Scintillation Detectors*

Objectives: 120 min.

1. Discuss the physics of converting light into electrons via photoelectric interactions in the crystals.
2. Discuss the use of collimators in limiting the photon beam.
3. Discuss the relationship between Spatial Resolution and Spatial Sensitivity in collimator choice.

11:00 Session completed

**Module III Week II Quiz II 2003C: INSTRUMENTATION**

9:00PM TOPIC: Lecture: *The Electronics of Scintigraphy*

Objectives: 120 min.

1. Discuss the Pulse Height Analyzer
2. Discuss the use of Upper and Lower Level discriminators.
3. Discuss the Quality Control of a Gamma Camera.
4. Discuss the Daily Spatial Uniformity Flood.
5. Discuss the Weekly Spatial Resolution Test.
6. Discuss the Weekly Spatial Linearity Test.
7. Discuss the Center of Rotation procedures.
8. Discuss the Uniformity Correction Flood.
Module III Week II Exam 2003C: INSTRUMENTATION

9:00 Exam Reviewed
11:00 Session completed

Module III Week III Quiz I 2003C: INSTRUMENTATION

9:00PM TOPIC: Lecture: PET Instrumentation

Objectives: 120 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.
5. Characterize the visual presentation of non-attenuated and attenuated corrected images.

11:00PM Session completed

Module III Week III Quiz II 2003C: INSTRUMENTATION

9:00PM TOPIC: Lecture: Acquisition, Processing, and Display of PET Images.

Objectives: 120 min.

1. Discuss 2D and 3D acquisition protocols.
2. Discuss scan protocol parameters.
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.

11:00PM Session completed.

Module III Week III Exam 2003C: INSTRUMENTATION

9:00 Exam Reviewed
11:00 Session completed

Module III Week IV Quiz I 2003C: INSTRUMENTATION

9:00PM: TOPIC: Quiz Review: PET Quality Control

Objectives: 120 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.

11:00PM Session completed.
Module III Week IV Quiz II

9:00PM TOPIC: Lecture *Troubleshooting Image Artifacts in PET/CT*

Objectives: 120 min.

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.
7. Analyze Metal Artifacts.
8. Identify Ring Artifacts.

11:00PM Session completed.

Module III Week IV Exam 2003C: INSTRUMENTATION

9:00 Exam Reviewed/ Post Test

11:00 Session completed