

THE TAMIL NADU DR. M.G.R. MEDICAL UNIVERSITY

[AHS 0222]

**FEBRUARY 2022
(OCTOBER 2021 EXAM SESSION)**

Sub. Code: 2306

**M.Sc. NUCLEAR MEDICINE TECHNOLOGY
FIRST YEAR**

(Candidates admitted from 2019-2020 onwards – Paper VI)

(Candidates admitted from 2020-2021 onwards – Paper VII)

PAPER VI & VII – NUCLEAR MEDICINE INSTRUMENTATION - I

Q.P. Code : 282306

Time: Three hours

Answer ALL Questions

Maximum: 100 Marks

I. Elaborate notes on: (2 x 20 = 40)

1. What is a Collimator of a Gamma Camera. Discuss in detail about the properties of various types of Collimators commonly used in a Clinical Setting.
2. Describe the construction and operating principles of all Non-Scintillation Detectors.

II. Write Short Notes on: (10x6 = 60)

1. Difference between Liquid Scintillation Counting System and Scintillation Crystal System.
2. Define NEMA Standards and its application in Nuclear Medicine.
3. List out and discuss various Quality Control Parameters required in SPECT Camera.
4. Draw a diagram and explain about Digital Storage of Images.
5. Techniques used to acquire Gated Cardiac SPECT.
6. Attenuation Correction by low dose CT images and Scatter Correction methods.
7. Definition of SUV, its calculation and use to generate quantitative measurements.
8. Partial Volume Effect and its significance.
9. Solid State Photo detectors and its use in Nuclear Medicine.
10. How to disinfect SPECT – CT facility during in the era of COVID patient imaging.

THE TAMIL NADU DR. M.G.R. MEDICAL UNIVERSITY

[AHS 0522]

MAY 2022

Sub. Code: 2306

**M.Sc. NUCLEAR MEDICINE TECHNOLOGY
FIRST YEAR**

(Candidates admitted from 2019-2020 onwards – Paper VI)

(Candidates admitted from 2020-2021 onwards – Paper VII)

PAPER VI & VII – NUCLEAR MEDICINE INSTRUMENTATION - I

Q.P. Code : 282306

Time: Three hours

Answer ALL Questions

Maximum: 100 Marks

I. Elaborate notes on:

(2 x 20 = 40)

1. Define SPECT and explain the basic principles behind the emission computed tomography.
2. Explain the steps involved in preparation of a patient for 18F-FDG PET Scan. Also list out the various modes of PET-CT Acquisition.

II. Write Short Notes on:

(10x6 = 60)

1. Interpretation of Sensitivity, Specificity, Prevalance and Accuracy and use in Nuclear Medicine.
2. Design and Operation of PET-CT system.
3. Describe Filters and explain the Low pass filter and Restoration filters.
4. Imaging techniques and Acquisition Parameters in obtaining flow studies, blood pool imaging – with specific response to performing a Bone Scan.
5. Filtered Back Projection and Iterative Reconstruction: Salient points.
6. Circular and Body countour orbits in SPECT CT Image acquisition.
7. Routine Quality Control Parameters in a SPECT CT.
8. Preparation and Imaging a Child with PET CT.
9. Partial volume effect and its significance in image reconstruction.
10. Intraoperative Gamma Probes.

THE TAMIL NADU DR. M.G.R. MEDICAL UNIVERSITY

[AHS 1022]

OCTOBER 2022

Sub. Code: 2306

M.Sc. NUCLEAR MEDICINE TECHNOLOGY

FIRST YEAR

(Candidates admitted from 2019-2020 onwards – Paper - VI)

(Candidates admitted from 2020-2021 onwards - Paper - VII)

PAPER VI & VII – NUCLEAR MEDICINE INSTRUMENTATION - I

Q. P. Code: 282306

Time: Three hours

Maximum: 100 Marks

Answer ALL Questions

I. Elaborate on: **(2 x 20 = 40)**

1. With the help of a neat diagram explain the working principle of thyroid uptake probe. How do you find out the working distance?
2. Discuss in detail the collimators used in rectilinear scanner. Focal length and focal depth of collimators used in rectilinear scanner.

II. Write notes on: **(10 x 6 = 60)**

1. Whole body counters.
2. Clinical application of per operative Gamma probe.
3. Working principle of photo multiplier tube (PMT).
4. Iso-response curve of focusing collimator.
5. Various factors affecting the resolution and sensitivity of rectilinear.
6. Modulation Transfer Function (MTF).
7. Profile scanners.
8. Working principle of Gamma Ray Spectrometer (GRS).
9. Spatial resolution.
10. Disadvantage of Rectilinear Scanner.

THE TAMIL NADU DR. M.G.R. MEDICAL UNIVERSITY

[AHS 1023]

OCTOBER 2023

Sub. Code: 2306

**M.Sc. NUCLEAR MEDICINE TECHNOLOGY
FIRST YEAR (From 2020-2021 onwards)
PAPER VII – NUCLEAR MEDICINE INSTRUMENTATION - I**

Q. P. Code: 282306

Time: Three hours

Maximum: 100 Marks

Answer ALL Questions

I. Elaborate on:

(2 x 20 = 40)

1. With the help of a neat diagram explain the working principle of Gamma camera.
2. Discuss the working principle of Gamma Ray Spectrometer (GR) with the help of a neat diagram.

II. Write notes on:

(10 x 6 = 60)

1. Crystals in gamma camera.
2. Explain Voltage response curve.
3. Role of Photo Multiplier Tube (PMT) in scintillation detectors.
4. Focal length and focal depth of focusing collimator.
5. Explain resolution and sensitivity of gamma camera.
6. Discuss shortly various probe systems used in nuclear medicine.
7. Explain ADC with its binary conversion.
8. Advantages and disadvantages of Gamma Ray Spectrometer (GRS).
9. Explain clinical applications of Whole body counters.
10. Thyroid uptake probe.

THE TAMIL NADU DR. M.G.R. MEDICAL UNIVERSITY

[AHS 1024]

OCTOBER 2024

Sub. Code: 2306

**M.Sc. NUCLEAR MEDICINE TECHNOLOGY
FIRST YEAR (From 2020-2021 onwards)
PAPER VII – NUCLEAR MEDICINE INSTRUMENTATION - I**

Q. P. Code: 282306

Time: Three hours

Maximum: 100 Marks

Answer ALL Questions

I. Elaborate on:

(2 x 20 = 40)

1. With the help of a neat diagram explain the working principle of Rectilinear Scanner.
2. Discuss in detail, nuclear gamma probe system with clinical applications.

II. Write notes on:

(10 x 6 = 60)

1. Explain the difference between the survey meter and contamination monitor.
2. Explain septa and its thickness in deciding image resolution.
3. Explain the angle variation of dynodes in PMT and its principle.
4. Explain the collimator in thyroid uptake probe.
5. Explain the counting statistics influencing image resolution in detail.
6. Explain how GRS helps in finding radionuclide energy.
7. Explain ADC with its binary conversion.
8. Advantages and disadvantages of Dose calibrator.
9. Explain clinical application of well counter.
10. Gamma probe uses and its principle.

THE TAMIL NADU DR. M.G.R. MEDICAL UNIVERSITY

[AHS 1025]

OCTOBER 2025

Sub. Code: 2306

**M.Sc. NUCLEAR MEDICINE TECHNOLOGY
FIRST YEAR (From 2020-2021 onwards)
PAPER VII – NUCLEAR MEDICINE INSTRUMENTATION – I**

Q. P. Code: 282306

Time: Three hours

Maximum: 100 Marks

Answer ALL Questions

I. Elaborate on:

(2 x 20 = 40)

1. Describe the design and functioning of a gamma ray spectrometer and explain its fundamental operation.
2. Explain the basic principles of collimators and discuss focused collimators with respect to the iso-response curve.

II. Write notes on:

(10 x 6 = 60)

1. Attenuation correction using low-dose CT images.
2. Butterworth filter: function and role in nuclear image processing.
3. Co-registration in PET/CT: principles and advantages.
4. Scatter correction methods in nuclear imaging.
5. Poisson distribution and its role in nuclear counting statistics.
6. Solid-state photo detectors: advantages over traditional PMTs.
7. Infusion systems for radionuclide injection.
8. Time-of-flight (TOF) scanners in PET imaging.
9. Nyquist frequency and cut-off frequency – effect on smoothing and noise.
10. Rectilinear scanner – basic design and clinical role.
