[LB 0212] **AUGUST 2012** **Sub. Code: 2111**

B.Sc. NUCLEAR MEDICINE TECHNOLOGY

SECOND YEAR

PAPER I – PHYSICS OF NUCLEAR MEDICINE INSTRUMENTATION

Q.P. Code : 802111

Time : Three hours **Maximum : 100 marks**

(180 Mins) Answer ALL questions in the same order.

I. Elaborate on:	**Pages (Max.)**	**Time (Max.)**	**Marks (Max.)**
1. Describe an uptake probe and explain it's working with respect to I131 uptake studies.	7	20	10
2. Describe the energy resolution of Gamma spectroscopy system.	7	20	10
3. Describe the basic principle of rectilinear scanner and focused collimator for scanning.	7	20	10

II. Write notes on:			
1. Describe the quality control tests for a Gamma camera – flood field uniformity, total system uniformity.	4	10	5
2. Explain briefly multicrystal camera.	4	10	5
3. Explain briefly liquid scintillation detectors.	4	10	5
4. Define Auger electron its relationship atomic number and its energy.	4	10	5
5. Explain briefly calibration of a spectrometer.	4	10	5
6. Explain the ionization chamber and GM counter and their uses in nuclear medicine.	4	10	5
7. Define Compton scattering. Explain its mechanism and significance in nuclear medicine and how to suppress them.	4	10	5
8. Describe the principle of Geiger Muller survey meter its uses, and its limitations.	4	10	5

III. Short answers on:			
1. Define hand held Gamma probe and material used for the probe.	4	10	5
2. Describe Gray scale display.	4	10	5
3. Define dead time, paralysable and non-paralysable systems.	4	10	5
4. Define Roentgen, Gray, and L.E.T.	4	10	5
5. Describe the coincidence detection.	4	10	5
6. Explain septal thickness of collimator with respect to resolution.	4	10	5
7. Describe the Chi square test with respect to P value.	4	10	5
8. Describe briefly the dot factor in imaging of radioactivity.	4	10	5
9. Describe collimator focus.	4	10	5
10. Explain briefly rate meter-time constant.	4	10	5

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[LD 0212] **AUGUST 2013** **Sub.Code :2111**

B.SC. NUCLEAR MEDICINE TECHNOLOGY

SECOND YEAR

PAPER –I – PHYSICS OF NUCLEAR MEDICINE INSTRUMENTATION

Q.P. Code: 802111

Time: Three hours **Maximum : 100 Marks**

Answer All questions

I Elaborate on: **(3x10 =30)**

1. System resolution, system sensitivity and matrix size and its relationship in image quality of gamma camera
2. Single channel analyzer, multichannel analyzer and window settings
3. Different parts and working principle of rectilinear scanner

II. Write Notes on: **(8x5=40)**

1. Geiger Muller counter
2. Survey meter with ionization chamber
3. Liquid scintillation detector
4. Shielding requirements for well counter
5. Precision and Accuracy
6. Gray curve and film density
7. Information density in bone scan
8. Poison distribution

III. Write Short Answers on: **(10x3=30)**

1. Percent standard deviation
2. Scan speed in bone scan
3. Timer in spectrometer
4. Septa thickness in collimator
5. Dynodes in photo multiplier tube
6. Proportional counter
7. Semiconductor detectors
8. Types of measurement error
9. Geometric efficiency of collimator
10. Statistical tests

*****

[LE 0212] **FEBRUARY 2014** **Sub.Code:2111**

B.SC. NUCLEAR MEDICINE TECHNOLOGY
SECOND YEAR
PAPER –I – PHYSICS OF NUCLEAR MEDICINE INSTRUMENTATION
Q.P. Code: 802111

Time: Three hours **Maximum : 100 Marks**

Answer all questions

I. Elaborate on: **(3x10 =30)**

1. Instrumentation and working principle of Rectilinear Scanner
2. Different collimators used in Gamma Camera
3. Chi-square statistical test and its application

II. Write Notes on: **(8x5=40)**

1. Isotope Calibrator
2. Well counter
3. Single channel pulse height analyzer
4. Gamma energy spectrum and window settings for counting
5. Gaussian distribution
6. Rate meters in Rectlinear Scanner
7. Uniformity in Gamma camera
8. Photo multiplier tube

III. Write short answers on: **(10x3=30)**

1. Ionization chamber
2. Thallium activated sodium iodine crystal
3. Application of pre-amplifier
4. Precision in statistics
5. Septa thickness
6. Cathode ray tube
7. Spatial resolution of collimator in gamma camera
8. Focal length of collimator in rectilinear scanner
9. Radionuclide I-131
10. Field of view

*****

[LF 0212] **AUGUST 2014** **Sub.Code :2111**

B.Sc. NUCLEAR MEDICINE TECHNOLOGY

SECOND YEAR

PAPER –I – PHYSICS OF NUCLEAR MEDICINE INSTRUMENTATION

Q.P. Code: 802111

Time: Three hours **Maximum : 100 Marks**

Answer All questions

I. Elaborate on: **(3 x 10 = 30)**

1. Explain the different types of collimators used in Gamma Camera.
2. Explain about the single channel analyzer , multi channel analyzer and window settings.
3. Explain the principle and working of a scintillation detector.

II. Write Notes on: **(8 x 5 = 40)**

1. Ionization Chamber.
2. Scintillation detector.
3. Well type counter.
4. Pre amplifier.
5. Data processing and their functions.
6. Spectra of Tc-99m and Cr-51.
7. Different Statistical test.
8. System Resolution.

III. Write short answers on: **(10 x 3 = 30)**

1. Dead Time correction in G M tube.
2. Pre amplifier.
3. Standard deviation.
4. Figure of merit.
5. Scan speed.
6. Types of measurement errors.
7. Septa thickness in collimators.
8. Precession and accuracy.
9. Poison and Gaussian distribution.
10. Application of cathode ray tube.

*****

[LG 0215] **FEBRUARY 2015** **Sub.Code :2111**

B.Sc. NUCLEAR MEDICINE TECHNOLOGY

SECOND YEAR

PAPER I – PHYSICS OF NUCLEAR MEDICINE INSTRUMENTATION

Q.P. Code: 802111

Time: Three hours **Maximum : 100 Marks**

Answer All questions

I. Elaborate on: **(3 x 10 = 30)**

1. Describe with basic principle, design and working of Gamma camera.
2. Explain the working principle of G.M. Counter.
3. Explain the principle and working of a scintillation detector.

II. Write Notes on: **(8 x 5 = 40)**

1. Ionization Chamber.
2. Liquid scintillation detector.
3. Pulse height analyzer.
4. Spectra of Tc-99m and I-131.
5. Integral and differential counting.
6. Different statistical tests.
7. System resolution.
8. Multi crystal scanners.

III. Write short answers on: **(10 x 3 = 30)**

1. Shielding requirement of well counter.
2. Window setting.
3. Standard deviation.
4. Figure of merit.
5. Gray curve.
6. Septa thickness in collimators.
7. Scan speed.
8. Geometric efficiency of collimators.
9. Precision and accuracy.
10. Pre amplifiers.

*****

[LH 0815] **AUGUST 2015** **Sub.Code :2111**

B.Sc. NUCLEAR MEDICINE TECHNOLOGY

SECOND YEAR

PAPER I – PHYSICS OF NUCLEAR MEDICINE INSTRUMENTATION

Q.P. Code: 802111

Time: Three Hours **Maximum : 100 Marks**

Answer All questions

I. Elaborate on: **(3 x 10 = 30)**

1. Explain about the single channel analyzer, multi channel analyzer and window settings.
2. Different collimators used in Gamma Camera.
3. Explain different types of detectors, its uses and applications.

II. Write Notes on: **(8 x 5 = 40)**

1. Isotope Calibrator.
2. Explain briefly multicrystal camera.
3. Rate meters in Rectilinear Scanner.
4. Gamma energy spectrum and window settings for counting.
5. Photo multiplier tube.
6. Factors affecting detection efficiency of a radiation measuring instrument.
7. Explain briefly calibration of a spectrometer.
8. Data processor and their function.

III. Short answers on: **(10 x 3 = 30)**

1. Coincidence detection.
2. Thallium activated sodium iodine crystal.
3. Application of pre-amplifier.
4. Hand held Gamma probe.
5. Film density.
6. The dot factor in imaging of radioactivity.
7. Spatial resolution of collimator in gamma camera.
8. Focal length of collimator in rectilinear scanner.
9. Radionuclide Iodine-131.
10. Field of view.

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[LI 0216] FEBRUARY 2016 **Sub.Code :2111**

B.Sc. NUCLEAR MEDICINE TECHNOLOGY

SECOND YEAR

PAPER I – PHYSICS OF NUCLEAR MEDICINE INSTRUMENTATION

Q.P. Code: 802111

Time: Three Hours **Maximum : 100 Marks**

Answer All questions

I. Elaborate on: **(3 x 10 = 30)**

1. Explain the principle and working of a scintillation detector.
2. Describe the basic principle of rectilinear scanner and focused collimator for Scanning.
3. Describe an uptake probe and explain it's working regarding Iodine-131 uptake studies.

II. Write Notes on: **(8 x 5 = 40)**

1. Describe any three quality control tests for a Gamma camera.
2. Isotope Calibrator.
3. Factors affecting detection efficiency of a radiation measuring instrument.
4. Explain the calibration of a spectrometer.
5. Data processing and their functions.
6. Describe the principle of Geiger Muller survey meter its uses, and its limitations.
7. Different Statistical test.
8. System Resolution.

III. Short answers on: **(10 x 3 = 30)**

1. Define dead time.
2. Pre amplifier.
3. Standard deviation.
4. Coincidence detection.
5. Rate meter-time constant.
6. Types of measurement errors.
7. The dot factor in imaging of radioactivity.
8. Information density in bone scan.
9. Poisson distribution.
10. Semiconductor detectors.

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[LJ 0816] AUGUST 2016 **Sub.Code :2111**

B.Sc. NUCLEAR MEDICINE TECHNOLOGY

SECOND YEAR

PAPER I – PHYSICS OF NUCLEAR MEDICINE INSTRUMENTATION

Q.P. Code: 802111

Time: Three Hours **Maximum : 100 Marks**

Answer All questions

I. Elaborate on: **(3 x 10 = 30)**

1. Explain the various types of collimators and their applications.
2. Explain the single and multi-channel analyzers.
3. Explain how to check the reliability of radiation counting instrument with the help of statistical tests.

II. Write Notes on: **(8 x 5 = 40)**

1. NaI(Tl) crystal.
2. Iso response curve.
3. Voltage response curve of gas filled radiation detectors.
4. Dose Calibrator.
5. Photomultiplier tube.
6. Uptake probe.
7. Gaussian distribution.
8. Spectra of Tc^{99m}.

III. Short answers on: **(10 x 3 = 30)**

1. Ratemeter.
2. Standard deviation.
3. Properties of some Scintillator materials.
4. Dead time.
5. FWHM.
6. Signal to noise ratio.
7. Geometric efficiency of Well counter.
8. Rectilinear scanner.
9. Conversion of counts per minute to activity.
10. Frequency domain.

****

[LK 0217] FEBRUARY 2017 **Sub.Code :2111**

B.Sc. NUCLEAR MEDICINE TECHNOLOGY

SECOND YEAR

PAPER I – PHYSICS OF NUCLEAR MEDICINE INSTRUMENTATION

Q.P. Code: 802111

Time: Three Hours **Maximum : 100 Marks**

Answer All questions

I. Elaborate on: **(3 x 10 = 30)**

1. Explain scintillation and semiconductor detectors used for radiation detection.
2. Explain t test and chi-square test.
3. Explain the various gas filled detectors with their voltage response curves.

II. Write Notes on: **(8 x 5 = 40)**

1. Flat field Collimators.
2. PMT.
3. GM counters.
4. Liquid scintillation detectors.
5. I^{131} Spectra.
6. Rectilinear scanner.
7. Counter paralysis.
8. Parallel hole High resolution collimators.

III. Short answers on: **(10 x 3 = 30)**

1. Spontaneous discharge.
2. Poisson distribution.
3. Pulse pile up.
4. Random errors.
5. Paralysable system.
6. Pinhole collimator.
7. Focal length in uptake probe.
8. Gamma probe.
9. Septal penetration.
10. Iso response curve.

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[LL 0817] AUGUST 2017 **Sub. Code: 2111**

B.Sc. NUCLEAR MEDICINE TECHNOLOGY
SECOND YEAR
PAPER I – PHYSICS OF NUCLEAR MEDICINE INSTRUMENTATION

Q.P. Code: 802111

Time: Three Hours **Maximum: 100 Marks**

Answer all questions

I. Elaborate on: **(3 x 10 = 30)**

1. Describe PET/CT detector crystals in detail.
2. Describe parts of gamma camera. Types of collimator.
3. Statistics of counting in gamma camera.

II. Write notes on: **(8 x 5 = 40)**

1. Thyroid uptake probe.
2. Sentinel gamma probe.
3. Liquid scintillation counter.
4. Photo mutipher fuse.
5. Analogue digital controls.
6. Total system resolution.
7. Frame mode acquisition.
8. Filter and accumulation methods.

III. Short answers on: **(10 x 3 = 30)**

1. ROI analysis.
2. Gray curve.
3. Iso-response curves.
4. Shielding.
5. Field of view.
6. NaI crystal.
7. Semiconductor detectors.
8. Poisson distribution
9. I-131 scan window setting.
10. Accuracy.

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[LM 0218] FEBRUARY 2018 **Sub. Code: 2111**

B.Sc. NUCLEAR MEDICINE TECHNOLOGY

SECOND YEAR

PAPER I – PHYSICS OF NUCLEAR MEDICINE INSTRUMENTATION

Q.P. Code: 802111

Time: Three Hours **Maximum : 100 Marks**

Answer All questions

I. Elaborate on: **(3 x 10 = 30)**

1. Types of collimator. Describe in detail.
2. Statistics of counting. Describe Chi-square test.
3. Rectilinear scanner. Describe in detail.

II. Write Notes on: **(8 x 5 = 40)**

1. Pulse height analyser.
2. Fluorescent scanning.
3. List mode acquisition.
4. Time activity curves.
5. Differential counting.
6. 511 Kev photon.
7. Gamma probe.
8. Geiger Muller counter.

III. Short answers on: **(10 x 3 = 30)**

1. Dead time correction.
2. Voltage amplifier.
3. Integral counting.
4. Types of measurement error.
5. Isotope Calibrator.
6. Confidence limit.
7. Gaussian distribution.
8. ISO response curves.
9. Rate meters.
10. Sensitivity of gamma camera.

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[LN 0818] AUGUST 2018 **Sub. Code: 2111**

B.Sc. NUCLEAR MEDICINE TECHNOLOGY

SECOND YEAR

PAPER I – PHYSICS OF NUCLEAR MEDICINE INSTRUMENTATION

Q.P. Code: 802111

Time: Three Hours **Maximum: 100 Marks**

Answer all questions

I. Elaborate on: **(3 x 10 = 30)**

1. Physics of position emission and Annihilation.
2. Gas filled radiation detectors.
3. Types of collimator. Describe in detail.

II. Write notes on: **(8 x 5 = 40)**

1. List of radionuclides that decay by positron emission.
2. Quality control of PET component of PET/CT scanner.
3. Semiconductor detectors.
4. Window settings.
5. Rectilinear scanner.
6. Resolution of system.
7. Types of common PET scanner configurations.
8. 511 Kev photon detectors.

III. Short answers on: **(10 x 3 = 30)**

1. Micro PET scanner.
2. TOF-PET scanner.
3. ROI analysis.
4. Cathode Ray tube.
5. Multi system crystal scanners.
6. Chi-square test.
7. Preamplifier.
8. Isotope Calibrator.
9. Crystal used in PET/CT scanner.
10. Poisson distribution.

****

[LO 0219] FEBRUARY 2019 **Sub. Code: 2111**

B.Sc. NUCLEAR MEDICINE TECHNOLOGY

SECOND YEAR

PAPER I – PHYSICS OF NUCLEAR MEDICINE INSTRUMENTATION

Q.P. Code: 802111

Time: Three Hours **Maximum: 100 Marks**

Answer all questions

I. Elaborate on: **(3 x 10 = 30)**

1. A leading surgeon wants his patient with Cancer of the Thyroid Gland to be treated with Radioactive Technetium. He had previously performed total thyroidectomy on the patient. Explain in detail about Radioactive Technetium and why it is not the appropriate isotope for treating Thyroid Cancers?
2. Define Radioactivity. What are Isotopes and how they are artificially produced? Briefly describe about the equipment required for producing medically useful radioactive elements.
3. Describe about the precautions to be followed while handling Radioactive Materials.

II. Write notes on: **(8 x 5 = 40)**

1. Dose to the target organ.
2. Properties of Ideal Radiopharmaceutical.
3. Effective Half Life of a Radioactive Element.
4. Uses of Radioactive Technetium.
5. Planar Imaging.
6. Positron Emission Tomography.
7. Collimators in Gamma Camera.
8. Handling Radioactive Spills.

III. Short answers on: **(10 x 3 = 30)**

1. Signal to Noise Ratio.
2. Isotopes.
3. Unstable Radionuclide.
4. Radioisotopes used for Treatment purpose.
5. Internal Conversion.
6. Sodium Iodine Crystal.
7. Spatial Resolution.
8. Radioimmuno Assays.
9. Geiger Muller Counter.
10. Cherenkov Radiation.

****

[LP 0819] AUGUST 2019 **Sub. Code: 2111**

B.Sc. NUCLEAR MEDICINE TECHNOLOGY

SECOND YEAR

PAPER I – PHYSICS OF NUCLEAR MEDICINE INSTRUMENTATION

Q.P. Code: 802111

Time: Three Hours **Maximum: 100 Marks**

Answer all questions

I. Elaborate on: **(3 x 10 = 30)**

1. A leading Medical Imaging Institution acquired a Gold Seal (Pre-owned) Gamma Camera. What are the types of Gamma Cameras and quality parameters required to evaluate its performance while its being installed in its premises?
2. What are Scintillation Detectors? Explain the various crystals currently available for PET Imaging and compare them with Sodium Iodide Detectors.
3. Explain in detail about the various precautions to be adopted while handling open, unsealed, radioactive active elements.

II. Write notes on: **(8 x 5 = 40)**

1. TLD Badges.
2. Effective Dose to the Body.
3. Spectrum Resolution of the Gamma Imaging Equipment.
4. Filtered Back Projection.
5. Dynamic Imaging.
6. Dead time of a Gamma Camera.
7. Beta Emitting Radionuclides.
8. Stable Nuclei.

III. Short answers on: **(10 x 3 = 30)**

1. Radioactive Technetium.
2. Positron Emitting Isotpoes.
3. Physical Half Life.
4. Pair Production.
5. Isomeric Transition.
6. Static Imaging.
7. Temporal Resolution.
8. Formula to calculate Effective Dose to the Patient.
9. Liquid Scintillation Counter.
10. Poisson distribution.

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[LQ 0220] FEBRUARY 2020 **Sub. Code: 2111**

B.Sc. NUCLEAR MEDICINE TECHNOLOGY

SECOND YEAR

PAPER I – PHYSICS OF NUCLEAR MEDICINE INSTRUMENTATION

Q.P. Code: 802111

Time: Three Hours **Maximum: 100 Marks**

Answer all questions

I. Elaborate on: **(3 x 10 = 30)**

1. Describe in detail how to design and construct a high dose radionuclide therapy ward for treating patients with radioactive iodine and similar radioactive medications.
2. The housekeeping staff, while cleaning the hot lab, drinks clear liquid from a beaker thinking that its water to quench his thirst. Subsequently he realises that it could be radioactive material. Discuss in detail how to determine various isotopes that could possibly be in the liquid he had just drunk?
3. Describe and explain the various quality control parameters involved in managing a SPECT – CT.

II. Write notes on: **(8 x 5 = 40)**

1. Protection of technologist while administering radioactive iodine.
2. Flat field collimator.
3. Measuring gamma and positron emission.
4. Modes of radioactive decay.
5. Radioisotope purity.
6. Shielding agents for alpha, beta, gamma and positron radiation.
7. The radioactive technetium generator.
8. Effective dose delivered to the body.

III. Short answers on: **(10 x 3 = 30)**

1. Inverse square law.
2. Crystals in PET Imaging.
3. Stable radionuclide.
4. Alpha decay.
5. Sterility and pyrogen testing.
6. Spatial resolution.
7. Cathode ray tube.
8. Image segmentation in nuclear medicine.
9. Operating voltage of a G.M. counter.
10. Pocket dosimeter.

****

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

[AHS 0321] **MARCH 2021** **Sub. Code: 2111**

(AUGUST 2020 EXAM SESSION)

B.Sc. NUCLEAR MEDICINE TECHNOLOGY

SECOND YEAR (Regulations 2010-2011)

PAPER I – PHYSICS OF NUCLEAR MEDICINE INSTRUMENTATION

Q.P. Code : 802111

Time: Three hours **Answer ALL Questions** **Maximum: 100 Marks**

I. Elaborate on: **(3 x 10 = 30)**

1. Single channel analyzer, Multichannel analyzer and window settings.
2. Explain different types of collimators used in gamma camera.
3. Describe the principle and working of scintillation detector.

II. Write notes on: **(8 x 5 = 40)**

1. Pulse height analyzer.
2. GM counter.
3. Thyroid uptake probe.
4. Frame mode acquisition.
5. Flat field collimator.
6. PMT.
7. Counter paralysis.
8. Na I (Tl) crystal.

III. Short answers on: **(10 x 3 = 30)**

1. ROI analysis.
2. Cathode ray tube.
3. Partial volume effect.
4. Image segmentation in Nuclear Medicine.
5. Pocket dosimeter.
6. Septal thickness in collimator.
7. Dynodes in PMT.
8. TOF-PET.
9. Standard deviation.
10. Shielding requirement of well counter.

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

[AHS 0222] **FEBRUARY 2022** **Sub. Code: 2111**
(AUGUST 2021 EXAM SESSION)

B.Sc. NUCLEAR MEDICINE TECHNOLOGY
SECOND YEAR (Regulations 2010-2011)
PAPER I – PHYSICS OF NUCLEAR MEDICINE INSTRUMENTATION
Q.P. Code : 802111

Time: Three hours **Answer ALL Questions** **Maximum: 100 Marks**

I. Elaborate on: **(3 x 10 = 30)**

1. Explain with principle, design and working of Gamma camera.
2. Describe the different types of detectors, its uses and applications.
3. Explain how to check reliability of radiation counting instrument with the help of statistical tests.

II. Write notes on: **(8 x 5 = 40)**

1. Isoresponse curve.
2. Isodose calibrator.
3. Factors affecting detection efficiency of Radiation measuring instrument.
4. Ionization chamber.
5. Integral and differential counting.
6. Physics of positron emission and annihilation.
7. Well counter.
8. Data processing and their function.

III. Short answers on: **(10 x 3 = 30)**

1. Coincidence detection.
2. Field of view.
3. Dead time.
4. Signal to noise ratio.
5. Frequency domain.
6. Pulse pile –up.
7. Spontaneous discharge.
8. List mode acquisition.
9. Rate meter.
10. Semiconductor devices.

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

[AHS 0423] **APRIL 2023** **Sub. Code: 2111**

B.Sc. NUCLEAR MEDICINE TECHNOLOGY
SECOND YEAR (Regulations 2010-2011 & 2018-2019 onwards)
PAPER I – PHYSICS OF NUCLEAR MEDICINE INSTRUMENTATION
Q.P. Code: 802111

Time: Three hours **Answer ALL Questions** **Maximum: 100 Marks**

I. Elaborate on: **(3 x 10 = 30)**

1. Explain in detail-Interaction of Radiation with Matter.
2. Different Collimators used in Gamma Camera.
3. Explain different types of Detectors, its uses and applications.

II. Write Notes on: **(8 x 5 = 40)**

1. Isotope Calibrator.
2. Photo Multiplier Tube.
3. Calibration of a Spectrometer.
4. Different Statistical test.
5. Principle of Geiger Muller Survey Meter, its uses and its limitations.
6. Properties of ideal Radiopharmaceutical.
7. I - 131 Spectra.
8. Pulse height analyser.

III. Short Answers on: **(10 x 3 = 30)**

1. Inverse square law.
2. Types of measurement error.
3. Pocket dosimeter.
4. Radioactive Technetium.
5. Liquid Scintillation Counter.
6. Crystal used in PET / CT scanner.
7. Sensitivity of gamma camera.
8. Semiconductor detectors.
9. Signal to noise ratio.
10. Thallium activated Sodium Iodine Crystal.

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

[AHS 1123] **NOVEMBER 2023** **Sub. Code: 2111**

B.Sc. NUCLEAR MEDICINE TECHNOLOGY
SECOND YEAR (Regulations 2010-2011 & 2018-2019 onwards)
PAPER I – PHYSICS OF NUCLEAR MEDICINE INSTRUMENTATION
Q.P. Code: 802111

Time: Three hours **Answer ALL Questions** **Maximum: 100 Marks**

I. Elaborate on: **(3 x 10 = 30)**

1. Types of Detectors.
2. Collimators.
3. Principle of Gamma camera.

II. Write Notes on: **(8 x 5 = 40)**

1. Principles of GM Counter.
2. Pulse height analyser.
3. Types of Errors.
4. Principles of Nuclear Reactor.
5. Schematic diagram of PMT.
6. Gaussian distribution.
7. Cathode Ray Tube.
8. Thyroid Uptake probe.

III. Short Answers on: **(10 x 3 = 30)**

1. Effects of Quenching.
2. Applications of well counter.
3. Spatial resolution.
4. Film density.
5. Pile Up Correction.
6. Chi Square Test.
7. Beta counter.
8. Gamma probe.
9. Sodium iodide crystal.
10. List mode acquisition.

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

[AHS 0424] **APRIL 2024** **Sub. Code: 2111**

B.Sc. NUCLEAR MEDICINE TECHNOLOGY
SECOND YEAR (Regulations 2010-2011 & 2018-2019 onwards)
PAPER I – PHYSICS OF NUCLEAR MEDICINE INSTRUMENTATION
Q.P. Code: 802111

Time: Three hours **Answer ALL Questions** **Maximum: 100 Marks**

I. Elaborate on: **(3 x 10 = 30)**

1. Describe an uptake probe and explain it's working with respect to I-131 uptake Studies.
2. Explain the principle and working of a Scintillation Detector.
3. Explain the working principle of G.M. Counter.

II. Write Notes on: **(8 x 5 = 40)**

1. Spectra of Tc-99m and I-131.
2. Voltage amplifier.
3. Liquid scintillation detector.
4. Rate meters in Rectilinear Scanner.
5. Explain briefly calibration of a spectrometer.
6. Multicrystal Camera.
7. Data processing and their functions.
8. Fluorescent scanning.

III. Short Answers on: **(10 x 3 = 30)**

1. Voltage amplifier.
2. Cathode ray tube.
3. ROI analysis.
4. Pair Production.
5. Radioimmuno Assays.
6. Sterility and pyrogen testing.
7. Cherenkov radiation.
8. Positron Emitting Isotopes.
9. Unstable Radionuclide.
10. Chi-square test.

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

[AHS 1125] **NOVEMBER 2025** **Sub. Code: 2111**

B.Sc. NUCLEAR MEDICINE TECHNOLOGY
SECOND YEAR (Regulations 2010-2011, 2016-2017 & 2018-2019 onwards)
PAPER I – PHYSICS OF NUCLEAR MEDICINE INSTRUMENTATION
Q.P. Code: 802111

Time: Three hours **Answer ALL Questions** **Maximum: 100 Marks**

I. Elaborate on: **(3 x 10 = 30)**

1. Semi Conductor Detectors.
2. Collimators and its Utility.
3. Principle of Ionization chamber.

II. Write Notes on: **(8 x 5 = 40)**

1. Survey meter.
2. Liquid scintillation counter.
3. Flash ADC (Apparent Diffusion Coefficient).
4. Intrinsic uniformity.
5. Confidence limits.
6. Quality Control (QC) of dose calibrator.
7. Pulse height spectrum for Iodine 131.
8. Ionization detection region with applied voltage.

III. Short Answers on: **(10 x 3 = 30)**

1. Dynode.
2. Time activity curves.
3. SiPM Photomultipliers.
4. Median.
5. ROC curve.
6. Electron multiplication.
7. Window settings.
8. Quenching.
9. Single channel pulse height Analyzer.
10. Gated acquisition.

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