

[KY 015]

MAY 2011

Sub. Code: 4015

M.Sc. (MEDICAL PHYSICS) DEGREE EXAMINATION

FIRST YEAR

(Revised Regulations for Candidates admitted from 2010-2011)

PAPER V – RADIATION DETECTORS AND INSTRUMENTATION

Q.P. Code: 284015

Time : Three Hours

Maximum : 100 marks

Answer ALL questions

I. Elaborate on:

(2 x 20 = 40)

1. Explain the principle of luminescence dosimeters. Explain in detail
 - a) Thermoluminescent dosimeters.
 - b) Optically Stimulated Luminescence dosimeters.
 - c) Its application in radiation dosimetry.
2. Explain ionization chamber, proportional counter, GM counter.

II. Write notes on:

(10 x 6 = 60)

1. Explain the principle of calorimetry.
2. What are the desirable characteristics of thimble ionization chamber?
3. Explain about single channel analyzer and multi-channel analyzer.
4. Discuss in detail construction and working of condenser type chamber.
5. What is meant by area monitoring and personnel monitoring. Explain about BARC TLD badge.
6. Explain the working principle of Rem counter.
7. How Brachytherapy sources are calibrated. Explain any one method in detail.
8. Discuss MOSFET dosimetry.
9. Discuss Radiation field analyzer.
10. How OP-AMP works. Explain its application in radiation dosimeters.

M.Sc. (MEDICAL PHYSICS) DEGREE EXAMINATION**FIRST YEAR****(Revised Regulations for Candidates admitted from 2010-2011)****PAPER V – RADIATION DETECTORS AND INSTRUMENTATION****Q.P. Code: 284015****Time : Three Hours****Maximum : 100 marks****Answer ALL questions in the same order.****I. Elaborate on:**

	Pages (Max.)	Time (Max.)	Marks (Max.)
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|--|----|---------|----|
| 1. Explain the principle of gas filled detectors. Discuss the construction and working of thimble ionization chamber. | 17 | 40 min. | 20 |
| 2. Explain the basic principle of Thermo lumescent dosimeter. Discuss about TLD reader, personal monitoring badge, calibration and maintenance of dosimeter. | 17 | 40 min. | 20 |

II. Write notes on:

- | | | | |
|---|---|---------|---|
| 1. Principle of MOSFET. How it is used in radiation dosimetry. | 4 | 10 min. | 6 |
| 2. Explain desirable characteristics of thimble ionization chamber. | 4 | 10 min. | 6 |
| 3. Construction and working of condenser type chambers. | 4 | 10 min. | 6 |
| 4. Working principle of OP- AMP with schematic diagram. | 4 | 10 min. | 6 |
| 5. Radiation field analyzer. | 4 | 10 min. | 6 |
| 6. Use of well type ionization chamber in Brachytherapy source calibration. | 4 | 10 min. | 6 |
| 7. Single channel analyzer and multichannel analyzer. | 4 | 10 min. | 6 |
| 8. Film dosimetry system. | 4 | 10 min. | 6 |
| 9. What are the different types of personnel monitoring dosimeters? Discuss in detail about any one dosimetry system. | 4 | 10 min. | 6 |
| 10. Liquid scintillation counting system. | 4 | 10 min. | 6 |

M.Sc. (MEDICAL PHYSICS) DEGREE EXAMINATION**FIRST YEAR****(Revised Regulations for Candidates admitted from 2010-2011)****PAPER V – RADIATION DETECTORS AND INSTRUMENTATION****Q.P. Code: 284015****Time : Three Hours****Maximum : 100 marks****Answer ALL questions in the same order.****I. Elaborate on:****Pages Time Marks
(Max.) (Max.) (Max.)**

- | | | | |
|--|----|---------|----|
| 1. What are the various methods available for radiation detection and measurement? Explain any two methods in detail. | 17 | 40 min. | 20 |
| 2. (a) Explain the principle of Thermoluminescent Dosimetry.
(b) Write in detail the construction and working of TLD reader.
(c) Advantages and disadvantages of TLD and their applications. | 17 | 40 min. | 20 |

II. Write Notes on :

- | | | | |
|--|---|---------|---|
| 1. Characteristics of Operational Amplifier. | 4 | 10 min. | 6 |
| 2. AC-DC Converter. | 4 | 10 min. | 6 |
| 3. MOSFET Dosimetry. | 4 | 10 min. | 6 |
| 4. Desirable chamber characteristics for an ion chamber. | 4 | 10 min. | 6 |
| 5. Working Principle of Semiconductor detectors. | 4 | 10 min. | 6 |
| 6. Pocket Dosimeter. | 4 | 10 min. | 6 |
| 7. Maintenance of dosimeters and surveyimeters. | 4 | 10 min. | 6 |
| 8. Area Monitoring. | 4 | 10 min. | 6 |
| 9. Gamma ray spectrometry. | 4 | 10 min. | 6 |
| 10. Optically Stimulated Luminescence Dosimeter. | 4 | 10 min. | 6 |

M.Sc. (MEDICAL PHYSICS) DEGREE EXAMINATION

FIRST YEAR

(Revised Regulations for Candidates admitted from 2010-2011)

PAPER V – RADIATION DETECTORS AND INSTRUMENTATION

Q.P. Code: 284015

Time : Three Hours

Maximum : 100 marks

Answer ALL questions

I. Elaborate on:

(2 x 20 = 40)

1. Write in detail about the gas filled detectors.
2. (a) Explain the principle of luminescence Dosimetry.
(b) Write in detail about:
 - (i) TLD
 - (ii) OSLD and
 - (iii) Radiophotoluminescent Dosimeters.

II. Write notes on:

(10 x 6 = 60)

1. Calorimetry.
2. JFET.
3. Radio isotope calibrator.
4. Stem effect and stem correction for condenser chambers.
5. Film dosimetry.
6. Radiation Field Analyser.
7. Liquid Scintillation Counting.
8. Construction of a thimble chamber with a neat diagram.
9. Personnel Monitoring.
10. Contamination Monitors.

M.Sc. (MEDICAL PHYSICS) DEGREE EXAMINATION

FIRST YEAR

(Revised Regulations for Candidates admitted from 2010-2011 onwards)

PAPER V – RADIATION DETECTORS AND INSTRUMENTATION

Q.P. Code: 284015

Time : Three Hours

Maximum : 100 marks

Answer ALL questions

I. Elaborate on:

(2 x 20 = 40)

1. (a) How the charge collection varies with operating voltage in a gas filled radiation detector using a trend graphically and write various regions of gas filled operation.
(b) The important properties of ideal scintillation material.
2. (a) Draw the block diagram of typical scintillation detector based radiation measuring system and explain briefly the function of each block.
(b) Explain the quenching mechanism of organic quenched GM detectors.

II. Write notes on:

(10 x 6 = 60)

1. Single and multi channel Analyzer.
2. OSL and MOSFET dosimetry.
3. Characteristics of operational amplifiers.
4. Construction and working of thimble chamber.
5. Dead time and recovery time.
6. The properties of ideal semiconductor detector material.
7. Characteristics of organic and inorganic counters.
8. RIA counter.
9. Teletector and contamination monitor.
10. Radioisotope calibrator.

M.Sc. (MEDICAL PHYSICS) DEGREE EXAMINATION

FIRST YEAR

(Revised Regulations for Candidates admitted from 2010-2011 onwards)

PAPER V – RADIATION DETECTORS AND INSTRUMENTATION

Q.P. Code: 284015

Time : Three Hours

Maximum : 100 marks

Answer ALL questions

I. Elaborate on:

(2 x 20 = 40)

1. What is a radiation field analyzer? Explain in detail with necessary diagrams, how it can be used for the commissioning of a new linear accelerator?
2. What is personnel monitoring? State its role in radiation protection. Explain with neat diagrams, the description & working of any two personnel monitors.

II. Write notes on:

(10 x 6 = 60)

1. Chemical dosimeters and their role in radiation dosimetry.
2. Principle of semi-conductor detectors and their uses.
3. Contamination and how it can be monitored.
4. Whole body counters and the detectors used.
5. Multi-channel analyzer.
6. Calibration of thermoluminescent dosimeters.
7. Area gamma monitor.
8. Neutron detectors.
9. GM counter and its applications.
10. Merits and demerits of radiographic and radiochromic film.

[LH 0415]

OCTOBER 2015

Sub. Code: 4015

M.Sc., MEDICAL PHYSICS DEGREE EXAMINATION
(Revised Regulations for Candidates admitted from 2010-2011 Batch onwards)
FIRST YEAR
PAPER V – RADIATION DETECTORS AND INSTRUMENTATION

Q.P. Code : 284015

Time : Three hours

Maximum : 100 marks

I. Elaborate on :

(2 x 20 = 40)

1. a. Explain the principle of luminescence.
b. Explain in detail about thermo-luminescent dosimeters, optically stimulated luminescence dosimeters and Radio-photoluminescent dosimeters.
2. Explain about personnel monitoring. Write in detail about the TLD badge readers.

II. Write notes on:

(10 x 6 = 60)

1. Liquid scintillation counting system.
2. Calorimeters and radiation dose measurement.
3. AC –DC convertors.
4. JFET.
5. Farmer type ionisation chambers.
6. Methods for detection of neutrons.
7. Explain about film dosimetry systems.
8. Explain in detail about the calibration of brachytherapy source.
9. Radiation Field Analyser.
10. Write about the need for contamination monitor. Explain about head and foot monitors.

[LI 0416]

APRIL 2016

Sub. Code: 4015

**M.Sc., MEDICAL PHYSICS DEGREE EXAMINATION
FIRST YEAR
PAPER V – RADIATION DETECTORS AND INSTRUMENTATION**

Q.P. Code : 284015

Time : Three hours

Maximum : 100 Marks

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

1. Explain in detail about the gas filled detectors.
2. a) Explain about the role of personnel monitoring in radiation protection.
b) Explain about any two personnel monitoring devices in detail.

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

1. Single and multichannel analysers.
2. Film densitometers.
3. AC–DC convertors.
4. Radio isotope calibrators.
5. Condensor type chambers.
6. Dead time and recovery time.
7. MOSFET and its application in radiation dosimetry.
8. Principle and working of semiconductor detectors.
9. Radiation Field Analyser.
10. Gamma ray spectrometers.

[LJ 1016]

OCTOBER 2016

Sub. Code: 4015

**M.Sc. MEDICAL PHYSICS EXAMS
FIRST YEAR
PAPER V – RADIATION DETECTORS AND INSTRUMENTATION**

Q.P. Code : 284015

Time : Three hours

Maximum : 100 Marks

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

1. Explain Personal Monitoring Devices. Explain the working of Former Dosimeter.
2. Explain the Optically Stimulated Luminescent Dosimeter (OSLD) and chemical Dosimeter.

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

1. JFET and its dosimetry usage.
2. Liquid Scintillation Detectors.
3. Survey Meter.
4. AC-DC Convertors.
5. Thermo Luminescent Dosimeter (TLD).
6. Gamma Ray Spectrometer.
7. Isotope Calibrator.
8. Radiation Field Analyser (RFA).
9. Film Dosimeter.
10. Radioimmunoassay (RIA).

[LK 0517]

MAY 2017

Sub. Code: 4015

**M.Sc. MEDICAL PHYSICS EXAMS
FIRST YEAR
PAPER V – RADIATION DETECTORS AND INSTRUMENTATION**

Q.P. Code : 284015

Time : Three hours

Maximum : 100 Marks

I. Elaborate on:

(2 x 20 = 40)

1. What is personnel monitoring and explain its role in radiation protection? Explain with neat diagram, the working of film badge and TLD badges. List their merits and demerits.
2. Explain the construction and working of ionization chamber, proportional counter and GM counter.

II. Write notes on:

(10 x 6 = 60)

1. Working principle of operational amplifier with neat diagram.
2. Well type chamber and its application in brachytherapy.
3. Gamma area monitor.
4. Single channel and multichannel analyser.
5. Chemical dosimeter.
6. AC to DC converter.
7. Calorimeter.
8. Gamma radiography survey meter.
9. Liquid scintillation counter.
10. Solid state Nuclear Track detectors.

[LL 1017]

OCTOBER 2017

Sub. Code: 4015

**M.Sc. MEDICAL PHYSICS EXAMS
FIRST YEAR
PAPER V – RADIATION DETECTORS AND INSTRUMENTATION**

Q.P. Code : 284015

Time : Three hours

Maximum : 100 Marks

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

1. Discuss in detail about the Radiation field analyzer (RFA).
2. Explain the principle and function of MOSFET and describe its application in Radiotherapy.

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

1. Characteristics curve of the ionization detectors.
2. Condenser chamber.
3. Pocket dosimeter.
4. Optically Stimulated Luminescence Dosimeter (OSLD).
5. Chemical Dosimeter.
6. Radioisotope calibrator.
7. Neutron detector.
8. AC-DC converter.
9. Film badge.
10. Multichannel analyzer.

[LN 1018]

OCTOBER 2018

Sub. Code: 4015

M.Sc. MEDICAL PHYSICS DEGREE EXAMS

FIRST YEAR

PAPER V – RADIATION DETECTORS AND INSTRUMENTATION

Q.P. Code : 284015

Time : Three hours

Maximum : 100 marks

I. Elaborate on :

(2 x 20 = 40)

1. Explain the characteristics of Gas Filled detectors and discuss in detail about ion chamber, proportional counter and G-M Counter.
2. Describe the construction of Radiation Field Analyzer and its applications.

II. Write notes on:

(10 x 6 = 60)

1. Optically Stimulated Luminescence Dosimeter (OSLD).
2. Radiochromic film as a detector.
3. Integrated Circuits (ICs).
4. Condenser Chamber.
5. Pocket dosimeter.
6. Film Badge.
7. Switch Mode Power Supply (SMPS).
8. Contamination Monitor.
9. Well Type Ion Chamber.
10. NaI Scintillator.

[LP 1019]

OCTOBER 2019

Sub. Code: 4015

M.Sc. MEDICAL PHYSICS DEGREE EXAMS

FIRST YEAR

PAPER V – RADIATION DETECTORS AND INSTRUMENTATION

Q.P. Code : 284015

Time : Three hours

Maximum : 100 marks

I. Elaborate on :

(2 x 20 = 40)

1. Explain in detail the principle and construction of a condenser-type chamber and mention how it can be used to measure radiation dose.
2. State the role of personnel monitoring in radiation protection. Explain with neat diagrams, the description and working of any two personnel monitors.

II. Write notes on:

(10 x 6 = 60)

1. GM counter and its application.
2. Optically stimulated luminescence dosimeters.
3. Chemical dosimeter and their role in radiotherapy.
4. Principle of semiconductor detector and their uses.
5. Area gamma monitor.
6. Decoders and encoders.
7. Teledose system.
8. Scintillation detector.
9. Hand and foot monitors and their applications.
10. Solid state nuclear track detector.

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

[AHS 0321]

MARCH 2021

Sub. Code: 4015

(OCTOBER 2020 EXAM SESSION)

M.Sc. MEDICAL PHYSICS

FIRST YEAR (From 2010-2011 onwards)

PAPER V – RADIATION DETECTORS AND INSTRUMENTATION

Q.P. Code : 284015

Time: Three hours

Answer ALL Questions

Maximum: 100 Marks

I. Elaborate notes on:

(2 x 20 = 40)

1. What is personnel monitoring? and explain its role in radiation protection. Explain with neat diagram, the working of film badge and TLD badges. List their advantages and disadvantages
2. a) Write the ideal properties of scintillation material.
b) Draw the block diagram of typical scintillation detector based radiation measuring system and explain briefly the function of each block.

II. Write Short Notes on:

(10x6 = 60)

1. Dead time and recovery time of gas filled detectors
2. Integrated circuit
3. MOSFET
4. Pocket dosimeter
5. Condenser type chamber
6. OSLD
7. Radiation field Analyzer
8. Industrial gamma radiography survey meter
9. Gamma ray spectrometers
10. Whole body counters

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

[AHS 0222]

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

Sub. Code: 4015

M.Sc. MEDICAL PHYSICS

FIRST YEAR

(Candidates admitted from 2010-2011 onwards – Paper V)

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

PAPER V & VI – RADIATION DETECTORS AND INSTRUMENTATION

Q.P. Code : 284015

Time: Three hours

Answer ALL Questions

Maximum: 100 Marks

I. Elaborate notes on:

(2 x 20 = 40)

1. Explain in detail about the variation of the charge collection with operating voltage in a gas filled radiation detector using a trend graphically and write various regions of gas filled operation.
2. Describe the construction of Radiation Field Analyzer and its applications

II. Write Short Notes on:

(10x6 = 60)

1. MOSFET
2. Explain the quenching mechanism of organic quenched GM detectors.
3. Semiconductor detector and its advantages and disadvantages
4. Well type ion chamber and its application in Brachy-therapy
5. Contamination monitor
6. AC-DC convertor
7. Radio immunoassay (RIA)
8. Thimble chamber
9. Solid State Nuclear track detectors
10. Calibration and maintenance of dosimeter
