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

[AHS 0222] **FEBRUARY 2022** **Sub. Code: 4014**
(OCTOBER 2021 EXAM SESSION)

M.Sc. MEDICAL PHYSICS
FIRST YEAR
(Candidates admitted from 2010-2011 onwards – Paper IV)
(Candidates admitted from 2020-2021 onwards – Paper V)
PAPER IV & V – RADIATION DOSIMETRY AND STANDARDIZATION
Q.P. Code : 284014

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

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

1. Explain in detail about the Spencer Attix and Burlin cavity theories in detail.
2. Explain in detail about the calibration of a HDR source using well type chamber.

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

1. Show that the roentgen to rad conversion factor for air is 0.876 under CPE.
2. Photo neutrons.
3. Reactor produced isotopes.
4. Kerma, Absorbed dose and centre of electron production .
5. IAEA TRS -277
6. Liquid scintillation counters.
7. Beer – Lambert's law and applications of chemical dosimeters in radiotherapy.
8. FBX dosimeter.
9. Theory and operation of Silicon Diode detectors.
10. Discuss about the calibration of survey meters and its recommended frequency of calibration in India.

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

[AHS 0522] **MAY 2022** **Sub. Code: 4014**

M.Sc. (MEDICAL PHYSICS) DEGREE EXAMINATION
FIRST YEAR
(Revised Regulations for Candidates admitted from 2010-2011)
PAPER IV – RADIATION DOSIMETRY AND STANDARDIZATION

Q.P. Code: 284014

Time : Three Hours **Maximum : 100 marks**

Answer ALL questions

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

1. Explain Liquid counter and windowless counting of liquid samples.
2. Manganese sulphate bath system and scintillation detectors.

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

1. Energy flux and fluence.
2. Air Kerma rate constant.
3. Radioactive tracers.
4. Ceric Sulphate dosimeter.
5. Significance of Temperature and Pressure correction.
6. Define solid angle.
7. Optical Density.
8. Reactor produced isotopes and their uses.
9. Limitations of Free air ionisation chambers.
10. IAEA TECDOC1274 - Give a summary of the report.

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

[AHS 1022] **OCTOBER 2022** **Sub. Code: 4014**

M.Sc. MEDICAL PHYSICS
FIRST YEAR
(Candidates admitted from 2010-2011 onwards – Paper - IV)
(Candidates admitted from 2020-2021 onwards – Paper – V)
PAPER IV & V– RADIATION DOSIMETRY AND STANDARDIZATION

Q.P. Code: 284014

Time : Three Hours **Maximum : 100 marks**

Answer ALL questions

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

1. Describe the each dosimetric parameter used in IAEA TRS-398 protocol and explain the procedure to obtain an absolute dose measurement for 6 MV photons in a linear accelerator.

2. Explain (i) Scintillation counting methods.
   (ii) Charge collection efficiency of an ion chamber based on Mie theory.

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

1. Traceability.
2. Re-entrant ionisation chamber.
3. FBX Dosimeter.
4. Calibration Factor.
5. Beam quality.
6. Radio colloids.
7. Charge particle equilibrium.
8. Decay scheme of Telecobalt and Brachytherapy Caesium sources.
9. Perturbation.
10. Transmittance and Absorbance.

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

[AHS 1023] **OCTOBER 2023** **Sub. Code: 4014**

M.Sc. MEDICAL PHYSICS
FIRST YEAR (From 2020-2021 onwards)
PAPER V – RADIATION DOSIMETRY AND STANDARDIZATION

Q.P. Code: 284014

Time: Three Hours **Maximum: 100 marks**

Answer ALL questions

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

1. Explain the IAEA TRS 398 calibration protocol for high-energy photon beams. Explain how IAEA's TRS-398 protocol differs from TG-51?

2. a) Mathematical derivation for Bragg-Gray theory principle.
   b) Spencers-Attix and Burlin cavity theory.

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

1. Dose equivalent, Ambient and directional dose equivalent.
2. Free air ionization chamber and its limitation.
3. Definition of calibration factors – N_X, N_K, $N_{D,air}$, $N_{D,W}$ in IAEA TRS277 protocol.
4. Compare characteristics of the proportional counter, GM counter and scintillation counters.
5. Transient charge particle equilibrium.
6. Scintillation counting methods of alpha, beta and gamma emitter.
7. Two voltage methods for continuous and pulsed beams.
8. Radiochemistry of water, aqueous solutions and peroxy radicals.
9. Beer – Lambert's law and applications of chemical dosimeters in radiotherapy.
10. Manganese sulphate bath system.

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

[AHS 1024] **OCTOBER 2024** **Sub. Code: 4014**

M.Sc. MEDICAL PHYSICS
FIRST YEAR (From 2020-2021 onwards)
PAPER V – RADIATION DOSIMETRY AND STANDARDIZATION

Q.P. Code: 284014

Time: Three Hours **Maximum: 100 marks**

Answer ALL questions

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

1. Write in detail about the construction and working of Free Air Ionisation Chamber (FAIC) with a neat diagram. List down its limitations.

2. What are Chemical Dosimeters? Explain about Fricke Dosimeter. Write down the clinical applications of chemical dosimeters.

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

1. Free radicals and its applications.
2. Reactor produced isotopes.
3. Calibration of brachytherapy sources using well type chamber.
4. Beam Quality Index and its estimation using TRS-398 and TG-51.
5. Beta gamma coincidence counting.
6. Extrapolation Chamber.
7. Characteristics of radioactive tracers.
8. Define Particle flux, Particle fluence and W value.
9. Photo neutrons.
10. Write down the correction factors to be applied in photon beam calibration using TRS -398 Protocol.

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

[AHS 1025] **OCTOBER 2025** **Sub. Code:4014**

M.Sc. MEDICAL PHYSICS
FIRST YEAR (From 2020-2021 onwards)
PAPER V– RADIATION DOSIMETRY AND STANDARDIZATION

Q.P. Code: 284014

Time: Three Hours **Maximum: 100 marks**

Answer ALL questions

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

1. Explain in detail about the various methods of neutron dose measurements.

2. Explain about the calibration of HDR source using well type chamber.

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

1. Limitations of free air ionization chamber.
2. Explain about Kerma in detail and derive a relationship between Kerma and exposure.
3. Spencer Attix cavity theory.
4. Extrapolation chamber.
5. Derive an expression for Dgas in terms of the volume of the chamber.
6. Correction factors used in the calibration of photons using TRS 398 protocol.
7. Cyclotron produced isotopes.
8. Define optical density, molar absorption coefficient and explain about Beer-Lambert's law.
9. Charged particle equilibrium.
10. Ceric sulphate dosimeter.

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