[KY 014] **MAY 2011** **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. Describe the significance of dosimetry parameters used in IAEA TRS-398 protocol. Also explain that how this protocol differs from TG-51 AAPM protocol.

2. How do you calibrate a newly procured dosimeter to be used for calibration of Linear Accelerators? Explain the standardization methods used for Brachytherapy sources.

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

1. Primary Standard Dosimetry Laboratory.
2. Optical density.
3. Transient charged particle equilibrium.
4. Alpha Dosimetry.
5. Photo-neutron.
6. Radiochemistry of Water.
7. I-125 standardization.
8. Tissue Weighting Factor.
9. IAEA TRS-277.
10. Beer-Lambert’s Law.

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[LA 0512] **MAY 2012** **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 in the same order.

I. Elaborate on:	**Pages (Max.)**	**Time (Max.)**	**Marks (Max.)**
1. a) Explain the terms "primary standard and Secondary Standard". Describe with neat diagram how exposure is measured using Free Air Ionization Chamber			
b) Explain how the Ir^{192} source is standardized using Well type Ionization Chamber. Explain different correction factors involved in this procedure.	17	40 min.	20
2. a) Explain in detail how neutrons of different energies interact with tissue			
b) Discuss in detail the Manganese Sulphate bath method for primary standardization of Neutrons.	17	40 min.	20
II. Write short notes on:			
1. Define particle Fluence and Energy Fluence. Give their symbols and units.	4	10 min.	6
2. Explain two different types of dead time. Give formula for both.	4	10 min.	6
3. How neutrons are classified? Discuss the energy distribution of Thermal Neutrons.	4	10 min.	6
4. Write a short notes reactor and cyclotron produced radioisotopes.	4	10 min.	6
5. Define the following and give its unit (a) Mass Attenuation Coefficient (b) Mass Stopping Power (c) Linear Energy Transfer.	4	10 min.	6
6. Explain in brief "Bragg-Gray and Burlin Cavity" theories.	4	10 min.	6
7. Explain the principle Ceric and Cerous dosimeters.	4	10 min.	6
8. A 1 mCi point Co^{60} source is immersed in a unit density uniform water medium. Calculate the primary component of water- KERMA Rate/ mCi at 1 cm from the source in units of cGy/hr/mCi. The values of mean mass energy absorption coefficient and mass attenuation coefficient of water at Co60 Energy are 2.965×10^{-2} cm^2/gm and 6.323×10^2/gm respectively.	4	10 min.	6
9. Compare the characteristics of proportional, GM and scintillation counters.	4	10 min.	6
10. Distinguish between TRS-277 and TRS-398.	4	10 min.	6

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[LB 1012] **OCTOBER 2012** **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 in the same order.

I. Elaborate on:	**Pages (Max.)**	**Time (Max.)**	**Marks (Max.)**
1. Describe in detail about the measurement of absorbed dose to water high energy photon and electron beams using TRS 398 protocol.	17	40 min.	20
2. Discuss the various types of radiation sources and methods of production of isotopes for clinical use.	17	40 min.	20
II. Write notes on :			
1. Dose equivalent and equivalent dose.	4	10 min.	6
2. Parallel plate ion chamber.	4	10 min.	6
3. Air Kerma rate constant and Reference Air Kerma Rate.	4	10 min.	6
4. Neutron survey meters and calibration.	4	10 min.	6
5. Mass energy transfer and mass energy absorption coefficient.	4	10 min.	6
6. Charged particle equilibrium.	4	10 min.	6
7. Show that roentgen to rad conversion factor for air is 0.876.	4	10 min.	6
8. Beer-Lambert’s Law.	4	10 min.	6
9. Beam Quality Index.	4	10 min.	6
10. I-125 source standardization.	4	10 min.	6

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[LC 0413] **APRIL 2013** **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. Describe about Bragg – Gravy cavity theory and derive an expression for the volume of the cavity chamber.
2. Define calibration factors N_x, N_k, $N_{D.air}$, $N_{D,w}$ and quality factor. Explain about cross calibration method.

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

1. W value and G value.
2. Re-entrant ionization chamber.
3. Fricke dosimeter.
4. Define Apparent activity and standardization of HDR Ir-192 source.
5. Types of thermometers and Barometers and method of temperature and pressure correction.
6. Classification of neutron sources based on energy.
7. Compare the protocols of TRS 398 and TG 51.
8. Define particle flux and fluence.
9. Free air ion chamber.
10. Calorimetry.

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[LD 1013] **OCTOBER 2013** **Sub. Code: 4014**

M.Sc. (MEDICAL PHYSICS) DEGREE EXAMINATION

FIRST YEAR

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

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. Describe in detail about the classification of neutron sources and dosimetry procedures.
2. Compare the external beam calibration protocol of TRS 398 and TRS 277.

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

1. Ir-192 source standardization.
2. Directional dose equivalent.
3. Burlin and spencer Attix cavity theory.
4. Scintillation detector for neutron.
5. Linear and mass attenuation coefficient.
6. Preparation of radio colloids.
7. Transisent charged particle equilibrium.
8. Calibration factor N d,w.
9. Beam Quality correction.
10. Air kerma strength.

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[LF 1014] **OCTOBER 2014** **Sub. Code: 4014**

M.Sc. (MEDICAL PHYSICS) DEGREE EXAMINATION

FIRST YEAR

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

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 in detail about the calibration of high energy photons using IAEA TRS-398 protocol.
2. a) Define exposure and absorbed dose.

   b) Explain about Kerma in detail and derive a relationship between Kerma & exposure.

   c) Show that the roentgen to rad conversion factor for air is 0.876 under CPE.

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

1. Mass energy transfer and Mass energy absorption coefficients.
2. Classification of neutrons based on energy.
3. Charge particle equilibrium.
4. Cyclotron produced isotopes.
5. Bragg –Gray cavity theory
6. Beta gamma coincidence counting.
7. Explain about the free air ionization chamber with a neat diagram.
8. Fricke dosimeter.
9. Chemical dosimeters in radiotherapy.
10. Define apparent activity, Reference Air Kerma Rate, Air Kerma Rate constant.

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[LH 0415] **OCTOBER 2015** **Sub. Code: 4014**

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

Q.P. Code : 284014

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

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

1. Explain in detail about the calibration of high energy photon beams as per TRS-398 protocol.
2. Describe in detail about the Spencer-Attix and Burlin cavity theories.

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

1. Apparent activity and reference air kerma rate.
2. Reactor produced isotopes.
3. Neutron sources.
4. Show that the roentgen to rad conversion factor in air is0.876
5. Explain how the Ir192 source is standardized using well type ionization chamber. Explain different correction factor involved in this procedure.
6. Define the following and give its unit a) Mass attenuation coefficient b) mass stopping power ratio c) Linear energy transfer.
7. Transient charged particle equilibrium.
8. Application of chemical dosimeters in radiotherapy.
9. Beta gamma coincidence counting.
10. Properties of radionuclide to be used as a tracer.

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[LI 0416] APRIL 2016 **Sub. Code: 4014**

M.Sc., MEDICAL PHYSICS DEGREE EXAMINATION
FIRST YEAR
PAPER IV – RADIATION DOSIMETRY AND STANDARDIZATION

Q.P. Code : 284014

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

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

1. Compare the external beam calibration protocol of TRS 398 and TRS 277.

2. a) Write down the Principle of chemical Dosimetry.
   b) Explain in detail about the Fricke and FBX Dosimeters.

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

1. Equivalent dose and Effective dose.
2. Charge particle equilibrium.
3. Cyclotron produced isotopes.
4. Free air ionization chamber.
5. Spencer Attix theory.
6. Neutron survey meters and calibration.
7. Liquid scintillation systems.
8. Standardisation of beta emitters.
9. Radiochemistry of water.
10. Derive an expression for $D_{gas.}$

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[LJ 1016] OCTOBER 2016 **Sub. Code: 4014**

M.Sc. MEDICAL PHYSICS EXAMS
FIRST YEAR
PAPER IV – RADIATION DOSIMETRY AND STANDARDIZATION

Q.P. Code : 284014

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

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

1. State the Bragg-Gray cavity theory and derive the mathematical expression for absorbed dose to medium in terms of cavity ionization.

2. Absorbed dose calibration of high energy photon beams with $N_{D,\ W}$ with neat sketch.

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

1. Define kerma and components of kerma.
2. Photoneutron.
3. Transient charge particle equilibrium.
4. Cross-calibration.
5. Distinguish narrow beam geometry and broad beam geometry.
6. Linear energy transfer and dose rate effects.
7. Standardization of gamma emitters with scintillation spectrometers.
8. Free-air ionization chamber.
9. Cyclotron-produced isotopes.
10. Ambient and directional dose equivalents.

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[LL 1017] OCTOBER 2017 **Sub. Code: 4014**

M.Sc. MEDICAL PHYSICS EXAMS
FIRST YEAR
PAPER IV – RADIATION DOSIMETRY AND STANDARDIZATION

Q.P. Code : 284014

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

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

1. Explain about the IAEA TRS – 398 protocol and calibration of cobalt beams using this protocol.

2. a) Define exposure and absorbed dose.
   b) Explain about Kerma in detail and derive a relationship between Kerma and exposure.
   c) Show that the roentgen to rad conversion factor for air is 0.876 under CPE.

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

1. Mass energy transfer and Mass energy absorption coefficients.
2. Photo neutrons.
3. Cyclotron produced isotopes.
4. Bragg–Gray cavity theory
5. Beta gamma coincidence counting.
6. Explain about the free air ionization chamber with a neat diagram.
7. Fricke dosimeter.
8. Define apparent activity, Reference Air Kerma Rate, Air Kerma Rate constant.
9. Chemical dosimeters in radiotherapy.
10. Theory and operation of Silicon Diode detectors.

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[LN 1018] OCTOBER 2018 **Sub. Code: 4014**

M.Sc. MEDICAL PHYSICS EXAMS
FIRST YEAR
PAPER IV – RADIATION DOSIMETRY AND STANDARDIZATION

Q.P. Code : 284014

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

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

1. Explain how IAEA's TRS-398 protocol differ from TG-51.
2. Explain the mathematical derivation for Bragg-Gray theory principle.

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

1. Tissue Weighting Factor.
2. High Energy Beam Quality Index.
3. Standardisation of Beta emitters.
4. Neutron Dosimetry Principles.
5. Parallel plate chambers.
6. Beta Gamma Coincidence counting.
7. Limitations of Free air ion Chambers.
8. Temperature and Pressure correction.
9. Beer-Lambert's Law.
10. Bragg-Gray theory.

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[LP 1019] OCTOBER 2019 **Sub. Code: 4014**

M.Sc. MEDICAL PHYSICS EXAMS
FIRST YEAR
PAPER IV – RADIATION DOSIMETRY AND STANDARDIZATION

Q.P. Code : 284014

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

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

1. Explain how Ir-192 source is standardized using well type ionization chamber. Explain different correction factors involved in this procedure.

2. Write in detail about Spencers-Attix and Burlin cavity theory.

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

1. Radiation chemical yield.
2. Fission products.
3. Definition of calibration factors – Nx, Nk, ND.air, ND.w in IAEA TRS277 protocol.
4. Calibration of protection level instrument.
5. Neutron sources.
6. Standardization of beta emitters.
7. Beer-Lambert law.
8. Formation of free radicals in solids and their application in dosimetry.
9. Compare characteristics of proportional counter, GM counter and scintillation counters.
10. Define apparent activity, Reference air kerma rate, Air kerma and Air kerma rate constant.

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

[AHS 0321] **MARCH 2021** **Sub. Code: 4014**

(OCTOBER 2020 EXAM SESSION)

M.Sc. MEDICAL PHYSICS

FIRST YEAR (From 2010-2011 onwards)

PAPER IV – 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 calibration of high energy photons using IAEA TRS-398 protocol.
2. Discuss in detail about the methods available for neutron dose measurements.

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

1. Dose equivalent, Ambient and directional dose equivalent.
2. Mass energy transfer and Mass energy absorption coefficients.
3. Radioactive tracers.
4. Charge particle equilibrium.
5. Cyclotron produced isotopes.
6. Bragg –Gray cavity theory
7. Beta gamma coincidence counting.
8. Explain about the free air ionization chamber with a neat diagram.
9. Fricke dosimeter.
10. Define apparent activity, Reference Air Kerma Rate, Air Kerma Rate constant.

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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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