

[KY 011]

MAY 2011

Sub. Code: 4011

M.Sc. (MEDICAL PHYSICS) DEGREE EXAMINATION

FIRST YEAR

(Revised Regulations for Candidates admitted from 2010-2011)

PAPER I – RADIATION PHYSICS

Q.P. Code: 284011

Time : Three Hours

Maximum : 100 marks

Answer ALL questions

I. Elaborate on:

(2 x 20 = 40)

1. Natural and artificial radioactivity.
2. Interaction of ionizing radiation with matter.

II. Write notes on:

(10 x 6 = 60)

1. Binding energy.
2. Autotransformers.
3. Half-value layer.
4. Ohm's law.
5. Relative biological effectiveness (RBE).
6. Electron volt.
7. Cerenkov radiation.
8. Bragg curve.
9. Electronic equilibrium.
10. Atomic nucleus.

M.Sc. (MEDICAL PHYSICS) DEGREE EXAMINATION**FIRST YEAR****(Revised Regulations for Candidates admitted from 2010-2011)****PAPER I – RADIATION PHYSICS****Q.P. Code: 284011****Time : Three Hours****Maximum : 100 marks****Answer ALL questions in the same order.****I. Elaborate on:****Pages Time Marks
(Max.) (Max.) (Max.)**

- | | | | |
|--|----|---------|----|
| 1. Describe in detail about interaction of ionizing radiation with matter and importance of these interaction. | 17 | 40 min. | 20 |
| 2. Discuss the various methods of radioactive decay. | 17 | 40 min. | 20 |

II. Write Notes on:

- | | | | |
|--|---|---------|---|
| 1. Properties of alpha, beta and gamma radiation. | 4 | 10 min. | 6 |
| 2. Ionization and excitation. | 4 | 10 min. | 6 |
| 3. Bohr's atomic model. | 4 | 10 min. | 6 |
| 4. Energy transfer and energy co-efficient. | 4 | 10 min. | 6 |
| 5. Isotopes, Isobars, Isotones and Isomers. | 4 | 10 min. | 6 |
| 6. Bremsstrahlung and characteristics radiation. | 4 | 10 min. | 6 |
| 7. Bragg curve. | 4 | 10 min. | 6 |
| 8. Cerenkov radiation. | 4 | 10 min. | 6 |
| 9. Radiation quality factor and Tissue weighting factor. | 4 | 10 min. | 6 |
| 10. Mass defect and Binding energy. | 4 | 10 min. | 6 |

M.Sc. (MEDICAL PHYSICS) DEGREE EXAMINATION**FIRST YEAR****(Revised Regulations for Candidates admitted from 2010-2011)****PAPER I – RADIATION PHYSICS****Q.P. Code: 284011****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. Derive the Bethe-Bloch formulae for mass collision stopping power for charged particles. | 17 | 40 min. | 20 |
| 2. (a) Describe the following nuclear transformations with suitable example.
(i) alpha decay (ii) beta-minus decay (iii) beta-plus emission
(b) Discuss briefly the neutron induced nuclear reactions. | 17 | 40 min. | 20 |

II. Write notes on :

- | | | | |
|---|---|---------|---|
| 1. (a) Define Ohm's law and Coulomb's law of electric force.
(b) Discuss about the force on a current carrying conductor. | 4 | 10 min. | 6 |
| 2. What are electromagnetic radiation? Using inverse square law, calculate the exposure rate at 3 m distance from the source when the same is 100 mR/hr at 1m distance. | 4 | 10 min. | 6 |
| 3. What is radioactive equilibrium? Derive the condition for transient and secular equilibrium. | 4 | 10 min. | 6 |
| 4. Define the following (i) Energy Fluence (ii) Intensity (iii) LET (iv) sievert (v) Exposure (vi) Electronic Attenuation Coefficient. | 4 | 10 min. | 6 |
| 5. Explain the salient features of Rutherford's atomic model. | 4 | 10 min. | 6 |
| 6. Explain Compton scattering and its relevance to clinical applications. | 4 | 10 min. | 6 |
| 7. Describe briefly about Cerenkov radiation. | 4 | 10 min. | 6 |
| 8. Distinguish between Bremsstrahlung and Characteristic radiation. | 4 | 10 min. | 6 |
| 9. (a) Derive the relationship between roentgen and rad.
(b) Give the comparison between KERMA and Absorbed dose. | 4 | 10 min. | 6 |
| 10. Draw the depth dose curve and explain the spread of Bragg peak in clinical use. | 4 | 10 min. | 6 |

[LC 0413]

APRIL 2013

Sub. Code: 4011

M.Sc. (MEDICAL PHYSICS) DEGREE EXAMINATION

FIRST YEAR

(Revised Regulations for Candidates admitted from 2010-2011)

PAPER I – RADIATION PHYSICS

Q.P. Code: 284011

Time : Three Hours

Maximum : 100 marks

Answer ALL questions

I. Elaborate on:

(2 x 20 = 40)

1. The structure of atom, explain the atom models and electronic configuration.
Explain atomic mass number and mass units.
2. Passage of Heavy charged particles thro matter. Explain the methods of energy loss
and write a note on Bragg curve.

II. Write notes on:

(10 x 6 = 60)

1. Work, force and energy.
2. Mass defect and atomic binding energy.
3. Mutual and self-induction.
4. Properties of alpha, beta and gamma radiation.
5. Photo-electric effect.
6. Transformers and Autotransformers.
7. Write on the methods of production of Radioisotopes.
8. Write a short note on Mass, electronic and atomic attenuation coefficients.
9. Pair production.
10. Neutron induces nuclear reaction.

[LD 1013]

OCTOBER 2013

Sub. Code: 4011

M.Sc. (MEDICAL PHYSICS) DEGREE EXAMINATION

FIRST YEAR

(Revised Regulations for Candidates admitted from 2010-2011)

PAPER I – RADIATION PHYSICS

Q.P. Code: 284011

Time : Three Hours

Maximum : 100 marks

Answer ALL questions

I. Elaborate on:

(2 x 20 = 40)

1. Explain in detail Proton – Neutron theory of Nuclear Composition, packing fraction, mass defect and atomic binding energy.
2. Write in detail about Electromagnetic induction, mutual induction, Transformers, Auto transformer. Explain the application of auto transformer.

II. Write notes on:

(10 x 6 = 60)

1. Linear Energy Transfer (LET) and Relative Biological effectiveness (RBE)?
2. Write a short note on Nuclear Stability.
3. Describe Gamow model of Alpha decay.
4. What is Nuclear Isomerism?
5. Mass, electronic and atomic attenuation coefficients.
6. What is meant by neutron activation?
7. Define Gray and KERMA and compare them.
8. Classical theory of inelastic collision.
9. Write short note on Bremsstrahlung radiation.
10. Explain Stopping power and Bragg curve.

[LF 1014]

OCTOBER 2014

Sub. Code: 4011

M.Sc. (MEDICAL PHYSICS) DEGREE EXAMINATION

FIRST YEAR

(Revised Regulations for Candidates admitted from 2010-2011)

PAPER I – RADIATION PHYSICS

Q.P. Code: 284011

Time : Three Hours

Maximum : 100 marks

Answer ALL questions

I. Elaborate on:

(2 x 20 = 40)

1. Explain in detail the various nuclear reactions with examples.
2. Explain in detail the interaction of heavy charged particles with matters.

II. Write notes on:

(10 x 6 = 60)

1. Rutherford's Nuclear Atomic Model and Bohr's Atomic model.
2. Radioactive equilibrium.
3. Photo electric effect.
4. Mass Defect.
5. Cerenkov Radiation.
6. Exposure, Absorbed Dose and KERMA.
7. Electronic Equilibrium and Relative Biological Effectiveness (RBE).
8. Attenuation coefficients.
9. Ionization and Radiation losses.
10. Continuous slowing down approximation.

[LH 0415]

OCTOBER 2015

Sub. Code: 4011

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

Q.P. Code : 284011

Time : Three hours

Maximum : 100 marks

I. Elaborate on :

(2 x 20 = 40)

1. a. Artificial radioactivity.
b. Nuclear reactions.
2. Interaction of neutron with matter.

II. Write notes on :

(10 x 6 = 60)

1. Motion of electron in electric and magnetic fields.
2. Cerenkov radiation.
3. Nuclear Atomic models.
4. Electromagnetic Magnetic Radiation Spectrum.
5. Nuclear Fission and Fusion.
6. Mode of interaction of ionizing radiation which is useful for imaging
7. Transformers.
8. Derive the relationship between Half Value Layer and Linear Attenuation Coefficient.
9. Continues slowing down approximation (CSDA).
10. Energy loss by charged particle collisions.

[LI 0416]

APRIL 2016

Sub. Code: 4011

**M.Sc., MEDICAL PHYSICS DEGREE EXAMINATION
FIRST YEAR
PAPER I – RADIATION PHYSICS**

Q.P. Code : 284011

Time : Three hours

Maximum : 100 Marks

I. Elaborate on :

(2 x 20 = 40)

1. A step up transformer has a turns ratio of 500:1 and a regulation of 2 % when the secondary output current is 400 mA. What is the secondary output voltage that accompanies this current if the primary input voltage is 200 V.
2. Discuss in detail the characteristics of heavy charged particle of radiation.

II. Write notes on :

(10 x 6 = 60)

1. Explain about Rutherford's nuclear atomic model.
2. Write note on motion of electron in a magnetic field.
3. Calculate the energy of one atomic mass unit in MeV.
4. Distinguish between wave model and quantum model
5. Explain about radioactivity.
6. Discuss about photon energy flux and fluence.
7. Explain about detour factors.
8. Discuss about neutron interaction with matter.
9. What are difference between dose and KERMA?
10. Person received equivalent dose of 20 mSv from alpha radiation. Calculate the absorbed dose.

[LJ 1016]

OCTOBER 2016

Sub. Code: 4011

**M.Sc. MEDICAL PHYSICS DEGREE EXAMS
FIRST YEAR
PAPER I – RADIATION PHYSICS**

Q.P. Code : 284011

Time : Three hours

Maximum : 100 Marks

I. Elaborate on:

(2 x 20 = 40)

1. Describe in detail, the construction and working of transformers. Describe various types of transformers and various losses in transformer.
2. Discuss in detail, the interaction of charged particles with matter.

II. Write notes on:

(10 x 6 = 60)

1. Motion of electron in electric field.
2. Mass defect and atomic binding energy.
3. Wave theory and Quantum theory of electromagnetic radiation.
4. Derive the equation of radioactive decay and half life.
5. Neutron bombardment and proton bombardment.
6. Stopping power ratio.
7. Relationship between kerma and exposure.
8. Photoelectric effect and its significance.
9. Bethe Bloch Formula.
10. LET and RBE.

[LK 0517]

MAY 2017

Sub. Code: 4011

**M.Sc. MEDICAL PHYSICS EXAMS
FIRST YEAR
PAPER I – RADIATION PHYSICS**

Q.P. Code : 284011

Time : Three hours

Maximum : 100 Marks

I. Elaborate on:

(2 x 20 = 40)

1. Discuss in detail, about the interaction of particulate radiation with matter and its significance in radiotherapy.
2. Give a detailed account of the various atomic models.

II. Write notes on:

(10 x 6 = 60)

1. Motion of electrons in magnetic field.
2. Ionization and excitation.
3. Mass defect and atomic binding energy.
4. Electromagnetic induction.
5. Quantum model.
6. Inverse square law of radiation.
7. Production of artificial radioactive isotopes.
8. Linear and Mass attenuation coefficient.
9. Compton effect of radiation.
10. Cerenkov radiation.

[LL 1017]

OCTOBER 2017

Sub. Code: 4011

**M.Sc. MEDICAL PHYSICS EXAMS
FIRST YEAR
PAPER I – RADIATION PHYSICS**

Q.P. Code : 284011

Time : Three hours

Maximum : 100 Marks

I. Elaborate on:

(2 x 20 = 40)

1. Explain the methods of charged particle interaction with matter.
2. What is Radioactivity? Write the laws of radioactivity and derive the expression for radioactive decay, and half life.

II. Write notes on:

(10 x 6 = 60)

1. Describe the motion of electron in crossed electric and magnetic field.
2. Describe packing fraction and mass defect.
3. Describe transformer and its function with a neat diagram.
4. Define Isotopes, Isobars and Isomers.
5. Describe nuclear fission and fusion.
6. Describe Radiation absorbed Dose and kerma.
7. Write a note on electronic equilibrium.
8. Describe the importance of Photoelectric interaction and Compton interaction in medical application.
9. Describe bremsstrahlung.
10. Write a note on Stopping power.

[LM 0518]

MAY 2018

Sub. Code: 4011

**M.Sc. MEDICAL PHYSICS EXAMS
FIRST YEAR
PAPER I – RADIATION PHYSICS**

Q.P. Code : 284011

Time : Three hours

Maximum : 100 Marks

I. Elaborate on:

(2 x 20 = 40)

1. What is artificial radioactivity? Explain the methods of production of artificial radioisotopes.
2. Explain the types of Photon interactions with matter in the energy range used in Radio diagnostics and Radiotherapy.

II. Write notes on:

(10 x 6 = 60)

1. Rutherford's and Bohr Atomic model.
2. Mass defect and atomic binding energy.
3. Mutual induction and self induction.
4. Laws of radioactive disintegration and derive the equation for the number of atoms present at any instant.
5. Radio-active equilibrium.
6. Define Curie and Becquerel and the relationship between the units.
7. Write the relationship between exposure, kerma and absorbed dose.
8. The dependence of RBE and OER on LET.
9. Explain the Bragg curve.
10. Continuous slowing down approximation.

[LN 1018]

OCTOBER 2018

Sub. Code: 4011

**M.Sc. MEDICAL PHYSICS DEGREE EXAMS
FIRST YEAR
PAPER I – RADIATION PHYSICS**

Q.P. Code : 284011

Time : Three hours

Maximum : 100 marks

I. Elaborate on :

(2 x 20 = 40)

1. Describe in detail about interaction of heavy charged particles with matter.
2. Write in detail about the principle of working of transformer and explain in detail about its types.

II. Write notes on :

(10 x 6 = 60)

1. Relation between KERMA and exposure.
2. Photoelectric effect.
3. Equivalent and effective dose.
4. Pair production and its application.
5. Define half life and derive an expression for it.
6. Stopping power ratio.
7. Cerenkov radiation.
8. Explain about the motion of an electron in an electric field.
9. Ionization and Excitation.
10. Merits and demerits of Rutherford atomic model.

[LP 1019]

OCTOBER 2019

Sub. Code: 4011

**M.Sc. MEDICAL PHYSICS DEGREE EXAMS
FIRST YEAR
PAPER I – RADIATION PHYSICS**

Q.P. Code : 284011

Time : Three hours

Maximum : 100 marks

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

1. Explain the method of neutron interaction with matter and energy transfer.
2. Discuss various models of atomic structures and bring put merits and demerits of each model.

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

1. What is mass defect and explain?
2. Explain about nuclear shell model.
3. Distinguish between mutual and self-induction.
4. Explain about beta positive decay with example.
5. Write about artificial radioactivity.
6. Explain about radiation weighting factor.
7. Explain about secular equilibrium with example.
8. What is radiative collision?
9. Write about Bragg curve.
10. The tissue exposed with exposure level of 10 R/min.
Calculate the absorbed dose to the tissue.

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

[AHS 0321]

MARCH 2021

Sub. Code: 4011

(OCTOBER 2020 EXAM SESSION)

M.Sc. MEDICAL PHYSICS

FIRST YEAR (From 2010-2011 onwards)

PAPER I – RADIATION PHYSICS

Q.P. Code : 284011

Time: Three hours

Answer ALL Questions

Maximum: 100 Marks

I. Elaborate notes on:

(2 x 20 = 40)

1. Explain with diagram of Alternative Current Generator working principle.
2. Explain with diagram of Fission and Fusion Reactors.

II. Write Short Notes on:

(10x6 = 60)

1. Explain Ohms law and Coulomb's law of electric force.
2. Explain Isotopes and Isomers with 2 examples.
3. What is Compton effect and Pair production.
4. Write about Artificial Radioactivity with 2 examples.
5. What is the radiation exposure at 1 meter distance, if it's exposure at 2 meters is 10R.
6. Merits and demerits of Rutherford Atomic Model.
7. Explain about Beta positive decay with example.
8. State the relation between Decay Constant and Half Life of a radioactive material.
9. Explain the Excitation and Ionisation.
10. Who discovered Radioactivity and What is Atomic No. & Mass No.

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

[AHS 0921]

**SEPTEMBER 2021
(MAY 2021 EXAM SESSION)**

Sub. Code: 4011

**M.Sc. MEDICAL PHYSICS
FIRST YEAR (From 2010-2011 onwards)
PAPER I – RADIATION PHYSICS
*Q.P. Code : 284011***

Time: Three hours

Answer ALL Questions

Maximum: 100 Marks

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

1. Explain the relative importance of various types of interactions of Radiation with matter.
2. Explain the properties of particle and photon radiations

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

1. State the SI unit of Energy and Radiation absorbed dose.
2. State the Transformer Law and its efficiency.
3. State the difference between Mutual and Self Induction.
4. What is LET(Linear Energy Transfer) and RBE(Relative Biological Effectiveness).
5. What is the radio-activity 2weeks before, if its present activity is 10curie and its Half Life is 7days.
6. Explain the Mass Defect.
7. Explain Stopping Power Ratio.
8. What is Linear and Mass absorption Coefficient.
9. What is Bragg Peak Curve.
10. Explain Isotope and Isomer with 2examples.

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

[AHS 0222]

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

Sub. Code: 4011

M.Sc. MEDICAL PHYSICS

FIRST YEAR

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

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

PAPER I & II – RADIATION PHYSICS

Q.P. Code : 284011

Time: Three hours

Answer ALL Questions

Maximum: 100 Marks

I. Elaborate notes on:

(2 x 20 = 40)

1. Explain the Electromagnetic wave Spectrum and Quantum model.
2. Explain the Transformer working principle and its types

II. Write Short Notes on:

(10x6 = 60)

1. Write the SI unit of Magnetic flux density and Electric capacitance.
2. Explain the Alpha-Proton nuclear reactions.
3. Explain Pair production and its application.
4. Explain the Atomic Structure.
5. What is the fraction of radiation comes out from 15cm thick brick wall, if its Half Value Layer(HVL) is 5cm.
6. Explain about Radiation Weighting Factor.
7. What is LET(Linear Energy Transfer) and RBE(Relative Biological Effectiveness).
8. What is Half Life Period and give 3 radioactive material's half life period.
9. Explain the Mutual and Self Induction.
10. Explain the Beta negative decay with example.
