

APRIL 2001

[KD 1517]

Sub. Code : 3025

DIPLOMA IN MEDICAL RADIOLOGY — THERAPY
EXAMINATION.

(New Regulations)

Paper I — MEDICAL RADIATION PHYSICS AS
APPLIED TO RADIOTHERAPY

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

1. What are Wedge Filters? Give clinical examples of various wedges with diagrams. (25)
 2. What are the biological effects of Radiation? What are the recent developments in Radiation protection? (25)
 3. Write short notes on : (5 × 10 = 50)
 - (a) TLD dosimeter
 - (b) Iridium 192
 - (c) Technitium 99 m
 - (d) P 32
 - (e) Maximum Permissible Dose.
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NOVEMBER 2001

[KE 1517]

Sub. Code : 3025

DIPLOMA IN MEDICAL RADIOLOGY – THERAPY
EXAMINATION.

(New Regulations)

Paper I — MEDICAL RADIATION PHYSICS AS
APPLIED TO RADIOTHERAPY

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

1. Discuss the various modes of Radioactive decay.
(25)
 2. Define and explain : Backscatter factor, Wedge factor, Tissue weighting factor, Use factor, f -factor. (25)
 3. Write briefly on : (5 × 10 = 50)
 - (a) Tissue–Air ratio
 - (b) Role of CT and Ultrasound in treatment planning
 - (c) Stochastic and non–stochastic effects
 - (d) Different types of chambers used in Radiation Dosimetry
 - (e) Recent developments in Brachytherapy.
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MARCH 2002

[KG 1517]

Sub. Code : 3025

DIPLOMA IN MEDICAL RADIOLOGY – THERAPY
EXAMINATION.

(New Regulations)

Part I

Paper I — MEDICAL RADIATION PHYSICS AS
APPLIED TO RADIOTHERAPY

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

1. Explain preloading, afterloading, Low Dose Rate, Medium Dose Rate, High Dose Rate, manual and remote techniques used in brachytherapy. Discuss on the advantages of micro High Dose Rate machines. (25)
 2. Compare the advantages and disadvantages of telecobalt machines and linear accelerators. Physical, therapeutic and protection parameters to be discussed. (25)
 3. Write short notes on : (5 × 10 = 50)
 - (a) Phantom materials.
 - (b) Various units for exposure, absorbed dose and dose equivalent.
 - (c) Source to skin distance and source to axis distance techniques in teletherapy.
 - (d) Thermoluminescent dosimetry.
 - (e) Tissue compensators.
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SEPTEMBER 2002

[KH 1517]

Sub. Code : 3025

**DIPLOMA IN MEDICAL RADIOLOGY –
THERAPY EXAMINATION.**

(New Regulations)

**Paper I — MEDICAL RADIATION PHYSICS AS
APPLIED TO RADIO THERAPY**

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

1. Describe the features of diagnostic and therapeutic X ray tubes. (25)
 2. Compare and contrast a Co^{60} unit with high energy Linear Accelerator. (25)
 3. Write short notes on : (5 × 10 = 50)
 - (a) SSD and SAD technique
 - (b) Mantle field
 - (c) Ir^{192} and its applications
 - (d) LDR–MDR–HDR
 - (e) Treatment techniques in Ca Cx.
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APRIL 2003

[KI 1517]

Sub. Code : 3025

**DIPLOMA IN MEDICAL RADIOLOGY
THERAPY EXAMINATION.**

(New Regulations)

**Paper I — MEDICAL RADIATION PHYSICS AS
APPLIED TO RADIOTHERAPY**

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

1. Discuss the physical properties of various radioisotopes used in brachytherapy. Detail their application and compare advantages of each. (25)
 2. Discuss in detail on beam directing, defining and modifying devices used in teletherapy. (25)
 3. Write short notes on : (5 × 10 = 50)
 - (a) Timer error in telecobalt machines
 - (b) Modern Radiotherapy simulator
 - (c) Manchester system for treatment of cancers of uterine cervix
 - (d) Tissue Air ratio, Tissue Phantom ratio and Tissue Maximum Ratio
 - (e) Compton Scattering.
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[KJ 1517]

**DIPLOMA IN MEDICAL RADIOLOGY
THERAPY EXAMINATION.**

Paper I — MEDICAL RADIATION PHYSICS AS APPLIED TO RADIOTHERAPY

Maximum : 100 marks

Theory : 80 marks

M.C.Q. : 20 marks

Answer ALL questions.

I. Two Essay Questions each carries 15 marks :

(1) Discuss in detail about various quality assurance tests to be carried out in a newly installed cobalt teletherapy unit.

(c) Percentage depth dose.

(10 × 5 = 50)

(2) X-Ray production.

(4) **Intensity Modulated Radiotherapy. [IMRT]**

(6) Tissue inhomogeneities correction methods.

(8) Manual after loading of Ir-192.

(9) Beta minus emission.

(10) Photo electric absorption.

AUGUST 2004

[KL 1517]

Sub. Code : 3025

**DIPLOMA IN MEDICAL RADIOLOGY THERAPY
EXAMINATION.**

(New Regulations)

Paper I — MEDICAL RADIATION PHYSICS AS APPLIED TO RADIOTHERAPY

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

Theory : Two hours and forty minutes	Theory : 80 marks
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M.C.Q. : Twenty minutes **M.C.Q. : 20 marks**

Answer ALL questions.

I. Essay Questions : (2 × 15 = 30)

(1) What is meant by radioactivity and what are the important properties of the particles and radiation emitted during radioactivity process. Write about the different radioactive disintegration processes with an example.

(2) What do you mean by radiation exposure and absorbed dose. Define their units. Explain how the radiation exposure can be estimated from a telecobolt machine using a thimble ionization chamber.

II. Write short notes on : (10 × 5 = 50)

- (a) Compton effect
- (b) Exponential attenuation
- (c) Bremsstrahlung X-rays
- (d) Linear accelerator
- (e) Tissue maximum ratio
- (f) Universal wedge filters
- (g) Radiation beam directional devices
- (h) Patterson parner rules
- (i) Maximum permissible dose equivalent limits
- (j) Field shaping in radiation therapy.

MARCH 2006

[KO 1517]

Sub. Code : 3025

**DIPLOMA IN MEDICAL RADIOLOGY THERAPY
EXAMINATION.**

**MEDICAL RADIATION PHYSICS AS APPLIED TO
RADIOTHERAPY**

Time : Three hours Maximum : 100 marks

Theory : Two hours and Theory : 80 marks
forty minutes

M.C.Q. : Twenty minutes M.C.Q. : 20 marks

Answer ALL questions.

Draw suitable diagrams wherever necessary.

I. Essay questions : (2 × 15 = 30)

(1) Explain with the help of suitable cross sectional diagram, the design and working of a linear accelerator capable of producing photon and electron beams.

(2) Write in detail regarding various dosimetric systems in interstitial brachytherapy with relevance to head and neck implants.

II. Short notes :

(10 × 5 = 50)

- (a) Compensators.
- (b) Roentgen and rad.
- (c) Immobilisation devices.
- (d) Simulator.
- (e) TAR and TMR.
- (f) Shielding blocks.
- (g) Effective doses equivalent.
- (h) Spinal cord tolerance dose.
- (i) Time, distance and shielding.
- (j) Wedges.

MARCH 2007

[KQ 1517]

Sub. Code : 3025

DIPLOMA IN M.R.T. EXAMINATION.

MEDICAL RADIATION PHYSICS AS APPLIED TO
RADIO THERAPY

Common to :

(Candidates admitted from 1993-94 onwards)

and

(Candidates admitted from 2004-05 onwards)

Time : Three hours

Maximum : 100 marks

Theory : Two hours and
forty minutes

Theory : 80 marks

M.C.Q. : Twenty minutes

M.C.Q. : 20 marks

Answer ALL questions.

Draw suitable diagrams wherever necessary.

I. Essay :

1. Discuss with a neat diagram about the construction of Linear Accelerator and its functioning. Discuss two specific clinical situations in which electron beam therapy is useful. (20)

2. Explain simulation process and simulator design and purpose of each of the components with a diagram. (15)

3. Compare and contrast the dose distribution rules for interstitial application. Discuss Remote after loading systems. (15)

II. Short notes : (6 × 5 = 30)

- (a) TLD
 - (b) Absorbed dose and effective dose.
 - (c) Area monitoring.
 - (d) Beam modifying devices.
 - (e) Immobilization devices.
 - (f) Hand molded and image related contours.
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MARCH 2008

[KS 1517]

Sub. Code : 3025

DIPLOMA IN M.R.T. EXAMINATION.

Paper I — MEDICAL RADIATION PHYSICS AS APPLIED TO
RADIOTHERAPY

(Common to all Regulations)

Q.P. Code : 343025

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

Draw suitable diagrams wherever necessary.

- I. Write essay on : (2 × 20 = 40)
1. Discuss merits and demerits of various radioactive isotopes used in Brachy therapy. (20)
 2. Compare the physical characteristics of Co60 beam with that of 18Mv x-rays with special reference to their clinical relevance.
(20)
- II. Write short notes on : (10 × 6 = 60)
1. Treatment Planning System.
 2. Penumbra.
 3. Dose Volume Histogram.
 4. TLD.
 5. SAD Technique.
 6. Multi Leaf Collimator.
 7. Step and Shoot IMRT.
 8. Immobilization Devices.
 9. Cylindrical Mould.
 10. Strontium 90.
-

September 2008

[KT 1517]

Sub. Code: 3025

**DIPLOMA IN MEDICAL RADIO THERAPY
EXAMINATION.**

**Paper I – MEDICAL RADIATION PHYSICS AS APPLIED TO
RADIOTHERAPY**

(Common to all candidates)

Q.P. Code : 343025

Time : Three hours

Maximum : 100 marks

Draw suitable diagram wherever necessary.

Answer ALL questions.

I. Essay questions :

(2 X 20 = 40)

1. Write about permanent interstitial implants, its principle and applications.
2. Discuss about intra cavitary radiotherapy principles, its applications.

II. Write short notes on :

(10 X 6 = 60)

1. Hyper fractionation.
 2. Negative II mesons (Pimesons).
 3. Production of Neutron beam.
 4. Conformal therapy.
 5. Half life.
 6. Gama Knife.
 7. Bolus.
 8. Thermoluminescence dosimeter.
 9. Tissue-Air-Ratio. (T.A.R.).
 10. Ionization.
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MARCH -2009

[KU 1517]

Sub. Code: 3025

**DIPLOMA IN MEDICAL RADIO THERAPY
EXAMINATION.**

**Paper I – MEDICAL RADIATION PHYSICS AS APPLIED TO
RADIOTHERAPY**

(Common to all candidates)

Q.P. Code : 343025

Time : Three hours

Maximum : 100 marks

Draw suitable diagram wherever necessary.

Answer ALL questions.

I. Essay questions : (2 X 20 = 40)

1. What is a Linear Accelerator? Draw a block diagram and discuss the parts of a typical medical linear accelerator. Discuss the clinical advantages of a Linear accelerator over a telecobalt machine.
2. What is the basis of fractionation? What is conventional fractionation? Write briefly on altered fraction and its clinical advantages. Explain linear quadratic model infractionation.

II. Write short notes on : (10 X 6 = 60)

1. Commissioning tests for a Telecobalt machine.
2. Isotopes used for various intraluminal brachytherapy and intravascular brachytherapy.
3. Pair production.
4. Define the following a) Half life b) Radioactivity c) Half value layer d) Tissue Air Ratio.
5. Beam modifying devices.
6. Gamma knife and cyber knife.
7. Chemical dosimetry.
8. List six distinct radiation protection features to be found in or around a 6 MV linear accelerator suite.
9. Absorption of low LET X ray photons by tissue generates fast electrons which in turn cause cell damage via two distinct mechanisms. Describe these two mechanisms with the aid of a diagram indicating the duration of molecular events involved.
10. Strontium 90.

September - 2009

[KV 1517]

Sub. Code: 3025

**DIPLOMA IN MEDICAL RADIO THERAPY
EXAMINATION.**

**Paper I – MEDICAL RADIATION PHYSICS AS APPLIED TO
RADIOTHERAPY
(Common to all candidates)**

Q.P. Code : 343025

Time : Three hours

Maximum : 100 marks

**Draw suitable diagram wherever necessary.
Answer ALL questions.**

I. Essay questions : (2 X 20 = 40)

1. Discuss interaction of radiation with matter.
2. Write about linear accelerator's physical principle and applications.

II. Write short notes on : (10 X 6 = 60)

1. Ionization chamber.
2. Linear energy transfer.
3. Alpha rays.
4. Wedges.
5. Low dose brachy.
6. Stochastic effects of radiation.
7. Gallium 67.
8. Multi leaf collimators.
9. Mantle field calculation.
10. Proton therapy principle.

March 2010

[KW 1517]

Sub. Code: 3025

DIPLOMA IN MEDICAL RADIO THERAPY EXAMINATION

**MEDICAL RADIATION PHYSICS AS APPLIED TO
RADIOTHERAPY**

(Common to all candidates)

Q.P. Code : 343025

Time : Three hours

Maximum : 100 marks

Draw suitable diagram wherever necessary

Answer ALL questions

I. Essay questions :

(2 x 20 = 40)

1. Discuss the various isotopes used in brachytherapy and their physical characteristics. Describe the ideal isotope used in brachytherapy.
2. What are photons? With suitable diagrams explain the different ways with which photons interact with matter. Draw a graph and illustrate the relative importance of the three principal modes of interaction as function of photon energy and atomic number of the absorber.

II. Write short notes on :

(10 x 6 = 60)

1. Back scatter.
2. Beam defining devices.
3. Commissioning tests for a telecobalt machine.
4. Multi leaf collimation.
5. Which is the most suitable radionuclide for external beam radiotherapy and explain the reasons for the same?
6. HDR versus LDR brachytherapy.
7. Compton effect.
8. Define the following:
 - a) Absorbed dose
 - b) Kerma
 - c) ALARA
 - d) Integral dose.
9. Wedge filters.
10. Radiation field analyzer (RFA).

September 2010

[KX 1517]

Sub. Code: 3025

**DIPLOMA IN MEDICAL RADIO THERAPY (D.M.R.T.)
EXAMINATION.**

**Part I for Candidates admitted upto 2003-04 & Candidates admitted
from 2008-09 onwards**

And

Paper I for Candidates admitted from 2004-05 to 2007-08

**MEDICAL RADIATION PHYSICS AS APPLIED TO
RADIOTHERAPY**

Q.P. Code : 343025

Time : Three hours

Maximum : 100 marks

Draw suitable diagram wherever necessary.

Answer ALL questions.

I. Essay questions :

(2 X 20 = 40)

1. Discuss the various modes of interaction of radiation with matter and their relevance as applicable to radiotherapy.
2. Describe the particle radiations of clinical use in radiotherapy and their relative merits and demerits.

II. Write short notes on :

(10 X 6 = 60)

1. Radiotherapy stimulators.
2. Remote after loading.
3. Rectal dosimetry.
4. Beam modifying devices.
5. Tomotherapy.
6. Iodine 125.
7. Compton Effect.
8. Heavy particle radiotherapy.
9. Permanent Implants.
10. Production of Neutron beam.

APRIL 2011

[KY 1517]

Sub. Code: 3025

**DIPLOMA IN MEDICAL RADIO THERAPY (DMRT)
EXAMINATION**

**MEDICAL RADIATION PHYSICS AS APPLIED TO
RADIOTHERAPY
Q.P. Code : 343025**

**Time : 3 hours
(180 Min)**

Maximum : 100 marks

Answer ALL questions in the same order.

I. Elaborate on :

	Pages (Max.)	Time (Max.)	Marks (Max.)
1. Compare the advantages and disadvantages of different radiation sources used in Brachytherapy. Discuss remote after loading system.	11	35	15
2. Discuss Stereotactic Radiotherapy.	11	35	15

II. Write notes on :

1. Iodine – 131.	4	10	7
2. Hemibody irradiation.	4	10	7
3. Wedge filters.	4	10	7
4. Radiotherapy simulators.	4	10	7
5. Proton therapy.	4	10	7
6. Hyperthermia.	4	10	7
7. Thermoluminescent Dosimeter.	4	10	7
8. Multileaf collimation.	4	10	7
9. Isodose curve.	4	10	7
10. Interaction of radiation with matter.	4	10	7

October 2011

[KZ 1517]

Sub. Code: 3025

**DIPLOMA IN MEDICAL RADIO THERAPY (DMRT) EXAMINATION
MEDICAL RADIATION PHYSICS AS APPLIED TO RADIOTHERAPY**

Q.P. Code : 343025

**Time : 3 hours
(180 Min)**

Maximum : 100 marks

Answer ALL questions in the same order.

I. Elaborate on :

	Pages (Max.)	Time (Max.)	Marks (Max.)
1. Describe the interaction of radiation with matter.	11	35 min.	15
2. Describe in detail the fundamental requirements and radiation safety aspects in installing a Linear Accelerator in your department.	11	35 min.	15

II. Write notes on :

1. Pair Production.	4	10 min.	7
2. Dose specification in brachytherapy.	4	10 min.	7
3. Dose volume histograms.	4	10 min.	7
4. IMRT.	4	10 min.	7
5. Maximum Permissible dose.	4	10 min.	7
6. HVL.	4	10 min.	7
7. Personal monitoring device in radiation.	4	10 min.	7
8. Mould room techniques.	4	10 min.	7
9. Isodose charts.	4	10 min.	7
10. Target volumes.	4	10 min.	7

[LA 1517]

April 2012

Sub. Code: 3025

DIPLOMA IN MEDICAL RADIO THERAPY (DMRT) EXAMINATION

MEDICAL RADIATION PHYSICS AS APPLIED TO RADIOTHERAPY

Q.P. Code : 343025

**Time : 3 hours
(180 Min)**

Maximum : 100 marks

Answer ALL questions in the same order.

I. Elaborate on :

	Pages (Max.)	Time (Max.)	Marks (Max.)
1. Discuss the merits and demerits of Cobalt therapy and Linear Accelerator.	16	35	15
2. Discuss the physics aspects and the applications of various particle therapy in radiation practice.	16	35	15

II. Write notes on :

1. Describe the applications of Wedge filters.	4	10	7
2. Describe the applications of Beam Modifiers.	4	10	7
3. Describe the Quality Assurance in Linear Accelerator .	4	10	7
4. Describe Inverse Square law and its basis in radiation therapy.	4	10	7
5. Describe the Compton Effect.	4	10	7
6. Describe the Shielding Devices .	4	10	7
7. Describe the Radiation Protection Aspects.	4	10	7
8. Describe the applications of Electron therapy.	4	10	7
9. Describe the Scattered radiation.	4	10	7
10. Describe the Gammazone monitor.	4	10	7

(LC 1517)

APRIL 2013

Sub. Code: 3025

DIPLOMA IN MEDICAL RADIO THERAPY (DMRT) EXAMINATION

MEDICAL RADIATION PHYSICS AS APPLIED TO RADIOTHERAPY

Q.P. Code : 343025

Time: Three Hours

Maximum: 100 marks

I. Elaborate on:

(2X15=30)

1. Discuss the interaction of Radiation with Matter
2. Describe the rationale for Intensity Modulated radiotherapy

II. Write notes on:

(10X7=70)

1. Discuss Short lived Isotopes
2. Describe the Beam Modifying devices
3. Describe the usefulness of On Board Imaging
4. Describe the applications of Bolus
5. Describe various Immobilisation in Radiation therapy
6. Describe the Air Kerma
7. Describe the Isocentre Mounting technique
8. Describe the Micro Multileaf Collimators
9. Describe the various Isodose patterns
10. Describe the Volume Implantation

(LD 1517)

OCTOBER 2013

Sub. Code: 3025

DIPLOMA IN MEDICAL RADIO THERAPY (DMRT) EXAMINATION

MEDICAL RADIATION PHYSICS AS APPLIED TO RADIOTHERAPY

Q.P. Code : 343025

Time: Three Hours

Maximum: 100 marks

I. Elaborate on:

(2X15=30)

1. Discuss the merits and demerits of Cobalt therapy and Linear Accelerator.
2. Discuss the physics aspects and the applications of various particle therapy in radiation practice.

II. Write notes on:

(10X7=70)

1. Describe the applications of Wedge filters.
2. Describe the applications of Beam Modifiers.
3. Describe the Quality Assurance in Linear Accelerator.
4. Describe Inverse Square law and its basis in radiation therapy.
5. Describe the Compton Effect.
6. Describe the Shielding Devices.
7. Describe the Radiation Protection Aspects.
8. Describe the applications of Electron therapy.
9. Describe the Scattered radiation.
10. Describe the Gammazone monitor.
