Rajiv Gandhi University of Health Sciences, Karnataka

II Year B.Sc. Radiotherapy Technology Degree Examination – 23-May-2025

Time: Three Hours **Max. Marks: 60 Marks**

RADIOTHERAPY (Part– I A)
FUNDAMENTAL OF PHYSICS (RS - 3)
Q.P. CODE: 1356

Your answers should be specific to the questions asked
Draw neat, labeled diagrams wherever necessary

LONG ESSAYS (Answer any Two) **2 x 10 = 20 Marks**

1. **Discuss the Radioactive Equilibrium with examples and Explain radioactive decay law**
2. Basic interactions between X-ray and matter
3. Explain the construction and working of X-Ray tube

SHORT ESSAYS (Answer any FIVE) **5 x 5 = 25 Marks**

4. Ionization and excitation process
5. Factors effecting quality of X-ray
6. Principles of the Nuclear Reactor
7. Artificial Radioactivity
8. Wave particle duality of nature
9. What is a Capacitor? Explain about construction and factors affecting capacitance.
10. Explain conduction, insulator and semiconductors

SHORT ANSWERS (Answer any FIVE) **5 x 3 = 15 Marks**

11. Half life
12. Electro magnetic spectrum
13. **Ohm's law**
14. Thermionic emission
15. **Anode heel effect**
16. LET and RBE
17. Radioactivity and its units

Rajiv Gandhi University of Health Sciences, Karnataka

II Year B.Sc. Radiotherapy Technology Degree Examination – 08-May-2025

Time: 3 Hours **Max. Marks: 30 Marks**

Radiation Biology, Applied Anatomy and Pathology (RS-3)
Q.P. CODE: 1357

Your answers should be specific to the questions asked.
Draw neat, labeled diagrams wherever necessary.
(Note: Both QP Codes 1357 and 1358 are to be answered within total duration of 3 hours)

LONG ESSAYS (Answer any One) **1 x 10 = 10 Marks**

1. What are the altered fractionation schedules in teletherapy? What is hypofractionation? Which cancers are suitable for hypofractionation and why?
2. What are the etiological factors for skin cancers? Write about pathological classification of skin cancers.

SHORT ESSAYS (Answer any Two) **2 x 5 = 10 Marks**

3. Pathology of testicular tumors.
4. **Proton beam therapy.**
   Or
   Oxygen effect &reoxygenation
5. Carcinogenesis.

SHORT ANSWERS (Answer any Five) **5 x 2 = 10 Marks**

6. Chromatid aberrations.
7. Stages of mitosis.
8. Types of benign tumors.
9. **LET**
10. Acutely responding normal tissues.
11. Permissible dose for radiation worker and general public.

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Rajiv Gandhi University of Health Sciences, Karnataka

II Year B.Sc. Radiotherapy Technology Degree Examination – 08-May-2025

Time: 3 Hours **Max. Marks: 30 Marks**

Principles of Radiotherapy (RS-3)
Q.P. Code: 1358

Your answers should be specific to the questions asked.
Draw neat, labeled diagrams wherever necessary
(Note: Both QP Codes 1357 and 1358 are to be answered within total duration of 3 hours)

LONG ESSAYS (Answer any One) **1 x 10 = 10 Marks**

1. Explain the management and treatment method for peadiatric cancer patient for craniospinal irradiation.
2. Explain the various techniques used to treat cancer in radiation therapy.

SHORT ESSAYS (Answer any Two) **2 x 5 = 10 Marks**

3. **TNM staging**
4. Explain patient positioning steps used during radiation therapy procedure.
5. Explain the complication associated with radiotherapy.

SHORT ANSWERS (Answer any Five) **5 x 2 = 10 Marks**

6. Mention the advantages of altered fractional in radiotherapy.
7. **Dysphagia**
8. Types of brachytherapy based on the dose rate of the source.
9. Late effects of radiation therapy.
10. **Signs and symptoms of Neoplasia**
11. **Mucositis**

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Rajiv Gandhi University of Health Sciences, Karnataka

II Year B.Sc. Radiotherapy Technology Degree Examination – 23-May-2025

Time: Three Hours **Max. Marks: 100 Marks**

Radiotherapy - Part – I A (RS-4)

Q.P. CODE: 3285

Your answers should be specific to the questions asked
Draw neat labeled diagrams wherever necessary

LONG ESSAYS (Second Question Choice) **2 x 10 = 20 Marks**

1. Enumerate the types of transformers used in x-ray equipment. Discuss the theory of an A.C. transformer and its construction
2. What is Radioactivity? What are the units of radioactivity? List the types of particle radiation emitted with their properties

   OR

   Enumerate the various radioactive nuclides used in medicine. List the properties of each them and clinical uses of each

SHORT ESSAYS (Question No 5 & 10 choice) **10 x 5 = 50 Marks**

3. Discuss the various Dosimetric quantities
4. Explain radioactive transformation and radioactive decay
5. Discuss the Compton effect with suitable clinical applications

   OR

   Discuss the quantum theory of radiation
6. Discuss the properties of radium and its daughter elements
7. Describe in detail about high voltage rectifier circuits
8. **Radioactive equilibrium**
9. **Line focus principle**
10. Discuss the construction of a nuclear reactor

    OR

    P-N junction diode
11. Describe the use of photographic film as a dosimeter
12. Discuss the advantages of semiconductor devices over thermionic devices

SHORT ANSWER **10 x 3 = 30 Marks**

13. Kirchoff's law
14. Pair production
15. Capacitors
16. Anode design
17. Beta particle
18. **Half – life**
19. Electric meters
20. Self induction
21. Fluorescence
22. Atomic number

Rajiv Gandhi University of Health Sciences, Karnataka

II Year B.Sc. Radiotherapy Technology Degree Examination – 08-May-2025

Time: Three Hours **Max. Marks: 50 Marks**

Radiotherapy - Part – I B (RS-4)
Radiation Biology & Applied Anatomy and Pathology
Q.P. CODE: 3286

Your answers should be specific to the questions asked
Draw neat labeled diagrams wherever necessary

LONG ESSAYS (Answer any one) **1 x 10 = 10 Marks**

1. Discuss the etiology, pathogenesis and staging of carcinoma cervix
2. Discuss the factors influencing carcinogenesis

5 x 5 = 25 Marks

SHORT ESSAYS (Answer any five)

3. Explain the acute effects of total body irradiation
4. Discuss about the cell survival curves
5. **Discuss the role of IGRT**
   Or
   Radiation effect on embryo and fetus
6. Describe the relationship between LET and RBE
7. Discuss the histological classification of lung tumors
8. Discuss time, dose and fractionation in radiotherapy

SHORT ANSWER **5 x 3 = 15 Marks**

9. **Neoplasia**
10. TLD
11. Skin cancer
12. Re-oxygenation
13. Benign tumors

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Rajiv Gandhi University of Health Sciences, Karnataka

II Year B.Sc. Radiotherapy Technology Degree Examination – 08-May-2025

Time: Three Hours **Max. Marks: 50 Marks**

Radiotherapy - Part – I B (RS-4)
Principles of Radiotherapy
Q.P. CODE: 3287

Your answers should be specific to the questions asked.
Draw neat labeled diagrams wherever necessary

LONG ESSAYS (Answer any one) **1 x 10 = 10 Marks**

1. What is multidisciplinary approach and how is breast cancer is managed by multidisciplinary team?
2. Describe in detail the complications associated with cancer and its treatment.

SHORT ESSAYS (Answer any five) **5 x 5 = 25 Marks**

3. **Planning a patient of oral cancer for 3D conformal radiotherapy.**
   Or
   Acute and late effects of radio therapy
4. Care and assistance during sedation/Anaesthesia in a paediatric patient.
5. **Steps involved in patient positioning for CA Breast patient for radio therapy**
6. Simulation in radiotherapy.
7. Prevention of spinal cord over dosage in head and neck cancer radiotherapy.
8. TNM classification.

SHORT ANSWER **5 x 3 = 15 Marks**

9. Causes of death in cancer.
10. **Dysphagia**
11. Physical effects of tumour.
12. **Pneumonitis**
13. **Brachytherapy types**

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Rajiv Gandhi University of Health Sciences, Karnataka

II Year B.Sc. Radiotherapy Technology Degree Examination – 28-Oct-2025

Time: Three Hours **Max. Marks: 60 Marks**

RADIOTHERAPY (Part– I – A)
FUNDAMENTAL OF PHYSICS (RS - 3)
Q.P. CODE: 1356

Your answers should be specific to the questions asked
Draw neat, labeled diagrams wherever necessary

LONG ESSAYS (Answer any Two) **2 x 10 = 20 Marks**

1. Discuss the factors affecting the quality and quantity of x-ray production
2. Discuss different ways of interaction of x-rays with matter. Discuss the Radiotherapeutic importance of each
3. What are Semiconductors? Explain principles of different types of semiconductors

SHORT ESSAYS (Answer any FIVE) **5 x 5 = 25 Marks**

4. Bremsstrahlung and characteristic x-rays
5. What are Gamma Rays and what are its properties?
6. Transformer theory and transformer construction
7. Define radioactive equilibrium. Explain different types of radioactive equilibrium with examples
8. **Structure of an atom**
9. What is Beta Decay? Briefly describe different types of beta decay with examples
10. Structure of a modern X-ray tube

SHORT ANSWERS (Answer any FIVE) **5 x 3 = 15 Marks**

11. Line focus principle
12. Half value thickness
13. Linear attenuation coefficient
14. **Filtration**
15. **Ohm's law**
16. Kirchhoff's Law
17. **Thermionic emission**

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Rajiv Gandhi University of Health Sciences, Karnataka

II Year B.Sc. Radiotherapy Technology Degree Examination – 30-Oct-2025

Time: 3 Hours **Max. Marks: 30 Marks**

Radiation Biology, Applied Anatomy and Pathology (RS-3)
Q.P. Code: 1357

Your answers should be specific to the questions asked.
Draw neat, labeled diagrams wherever necessary
(Note: Both QP Codes 1357 and 1358 are to be answered within total duration of 3 hours)

LONG ESSAYS (Answer any One) **1 x 10 = 10 Marks**

1. Discuss the applied anatomy of head and neck region. What are the causation factors and signs and symptoms of head and neck cancers?

2. Discuss the types of DNA damage and the repair mechanisms.

SHORT ESSAYS (Answer any Two) **2 x 5 = 10 Marks**

3. Altered fractionation in Radiotherapy.
4. LQ model
5. Factors influencing the cell survival curve.

SHORT ANSWERS (Answer any Five) **5 x 2 = 10 Marks**

6. Physical carcinogenesis.
7. LET
8. Hereditary cancers.
9. Sublethal damage.
10. Types of skin cancer.
11. Stochastic effect.

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Rajiv Gandhi University of Health Sciences, Karnataka

II Year B.Sc. Radiotherapy Technology Degree Examination – 30-Oct-2025

Time: 3 Hours **Max. Marks: 30 Marks**

Principles of Radiotherapy (RS-3)
Q.P. CODE: 1358

Your answers should be specific to the questions asked.
Draw neat, labeled diagrams wherever necessary.
(Note: Both QP Codes 1357 and 1358 are to be answered within total duration of 3 hours)

LONG ESSAYS (Answer any One) **1 x 10 = 10 Marks**

1. Explain the history and present practice of Brachytherapy.
2. Write a note on multi disciplinary approach for cancer management.

SHORT ESSAYS (Answer any Two) **2 x 5 = 10 Marks**

3. Explain external beam radiation therapy and its different techniques.
4. Explain steps involved in Intracavitary Brachytherapy.
5. Explain treatment planning position of Carcinoma Breast and the delivery method.

SHORT ANSWERS (Answer any Five) **5 x 2 = 10 Marks**

6. Explain Interstitial Brachytherapy.
7. What is Low Dose Rate Brachytherapy?
8. Explain position errors in Radiation Therapy.
9. Symptoms of Neoplasia on the patient body.
10. Importance of bladder protocol for the pelvis treatment.
11. Role of Anastasia in Radiation therapy.

Rajiv Gandhi University of Health Sciences, Karnataka

II Year B.Sc. Radiotherapy Technology Degree Examination – 28-Oct-2025

Time: Three Hours **Max. Marks: 100 Marks**

Radiotherapy - Part – I A (RS-4)

Q.P. CODE: 3285

Your answers should be specific to the questions asked.
Draw neat labeled diagrams wherever necessary

LONG ESSAYS (Second Question Choice) **2 x 10 = 20 Marks**

1. Discuss the various modes of radioactive decay.
2. Construction and working of fixed and rotating anode X-ray tube.
   OR
   Explain with diagram half wave and full wave rectifier.

SHORT ESSAYS (Question No 5 & 10 choice) **10 x 5 = 50 Marks**

3. Fluorescence and phosphorescence.
4. Properties of X-ray.
5. Write about the Ohm's law and Kirchoff's law.
   OR
   Structure of atom, nucleus, atomic number and mass number
6. Write about the properties of radium and its daughter products.
7. Explain working principle of transformer.
8. What is a capacitor? Explain about construction and factors affecting capacitance.
9. Explain about Radioactive equilibrium.
10. What is Half value Layer? Write about its application in the radiation treatment.
    OR
    Production of artificial radioactive isotopes.
11. Explain absorbed dose and KERMA and compare with graph.
12. Write about the radioactive nuclides and its use in medicine.

SHORT ANSWER **10 x 3 = 30 Marks**

13. Focal sport size.
14. Inverse square law.
15. Anode heel effect.
16. **Use of films in radiation dose measurement**
17. Linear energy transfer.
18. **Pair production**
19. Coulomb's law.
20. Definition of Rem, Sievert and Gray.
21. Alternating current.
22. Isotope.

Rajiv Gandhi University of Health Sciences, Karnataka

II Year B.Sc. Radiotherapy Technology Degree Examination – 30-Oct-2025

Time: Three Hours **Max. Marks: 50 Marks**

Radiotherapy - Part – I B (RS-4)
Radiation Biology & Applied Anatomy and Pathology
Q.P. CODE: 3286

Your answers should be specific to the questions asked.
Draw neat labeled diagrams wherever necessary

LONG ESSAYS (Answer any one) **1 x 10 = 10 Marks**

1. **What is radiation induced cancer? Mention the types, site of tumour and the agents causing cancer.**
2. **Explain cell survival curve in detail using LQ model. Mention its advantages, disadvantages and applications.**

SHORT ESSAYS (Answer any five) **5 x 5 = 25 Marks**

3. Describe in detail the effect of ionizing radiation on cancer cells. Explain in detail radio sensitivity of normal and tumour cells.
4. **Radiation effect on embryo and fetus**
5. Explain with examples of various fraction schedules in Radiotherapy.
6. Modes of spread of cancer.
7. Write a note on the radiation tolerance of the following organs.
   a. Eye
   b. Kidney

   How do you protect these organs while treating malignancy in the vicinity of these organs?
8. Describe in detail anatomy, pathology and staging of Head and Neck cancers.

SHORT ANSWER **5 x 3 = 15 Marks**

9. **RBE**
10. Testicular lymphatics.
11. **Dysphagia**
12. **Risk factors for prostate cancer**
13. **Effect of radiation on normal and abnormal cells**

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Rajiv Gandhi University of Health Sciences, Karnataka

II Year B.Sc. Radiotherapy Technology Degree Examination – 30-Oct-2025

Time: Three Hours **Max. Marks: 50**

Radiotherapy - Part – I B (RS-4)
Principles of Radiotherapy
Q.P. CODE: 3287

Your answers should be specific to the questions asked
Draw neat labeled diagrams wherever necessary

LONG ESSAYS (Answer any one) **1 x 10 = 10 Marks**

1. **A 68 year old gentleman presented with complaints of headache, vomiting and seizures. MRI brain suggestive of right frontel lobe lesion. He underwent Craniotomy and excision of tumour. The final histopathology was suggestive of glioblastoma multiforme WHO grade 4. Describe in detail the role of radiotherapy management of this patient and explain the immobilization technique used.**
2. **A 70 year old gentleman presented with complaints of lower abdominal pain, urinary retention and constipation of 1 week duration. Ultrasound done showed prostatomegaly. Biopsy of prostate suggestive of adenocarcinoma gleason score 4+3.**
   a) Describe in detail the role of radiotherapy in management of this patient.
   b) Elaborate on the immobilization technique used in management of carcinoma prostate.

SHORT ESSAYS (Answer any five) **5 x 5 = 25 Marks**

3. Describe altered fractionation and describe its advantages and disadvantages
4. Radiation cataractogenesis
5. Early and late effects of radiation
6. Role of concurrent chemotherapy as radiosensitizers
7. Describe on hyperthermia and mention the clinical applications
8. Write shortly on prevention and treatment of acute side effects after radiotherapy

SHORT ANSWER **5 x 3 = 15 Marks**

9. **TNM staging of cancers**
10. Write shortly on radiotherapy management of skin cancers
11. Bladder protocol
12. Describe regarding spread of neoplasia
13. ALARA

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