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MANIPAL UNIVERSITY

THIRD SEMESTER M.Sc. (MEDICAL RADIATION PHYSICS) DEGREE EXAMINATION – JANUARY 2014

SUBJECT: PAPER I – PHYSICS OF MEDICAL IMAGING

Wednesday, January 01, 2014

Time: 10:00 – 13:00 Hrs.

Max. Marks: 80

Answer ALL the questions.

1. Discuss in detail the two types of X-ray production resulting from an electron beam with a given kinetic energy incident on a tungsten target.
(20 marks)

2. Discuss the formation of a latent image on radiographic films by X-rays.
(20 marks)

3. Briefly discuss or define the following terms as they pertain to NMR:
 - 3A. Gyromagnetic ratio
 - 3B. Larmor equation
 - 3C. Free Induction Decay
 - 3D. T1 relaxation
 - 3E. T2 relaxation(20 marks)

4. **Write short notes on:**
 - 4A. Photostimulable phosphor
 - 4B. Grids
 - 4C. Applications of Ultrasound
 - 4D. K – edge filters

(5×4 = 20 marks)



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MANIPAL UNIVERSITY

THIRD SEMESTER M.Sc. (MEDICAL RADIATION PHYSICS) DEGREE EXAMINATION – JANUARY 2014

SUBJECT: PAPER II: PHYSICS OF RADIOTHERAPY

Friday, January 03, 2014

Time: 10:00 – 13:00 Hrs.

Max. Marks: 80

✍ Answer ALL the questions.

1. Discuss about the various parameters that affect the single photon beam isodose distribution.
(20 marks)

- 2A. Define TMR and TAR and derive the relationship between them.
- 2B. Discuss about the various phantoms used for dosimetry purposes.
(10+10 = 20 marks)

- 3A. Enumerate the properties of an ideal Brachytherapy source and characteristics of radio nuclides which meet the requirements.
- 3B. Discuss about the calibration of Brachytherapy sources.
(10+10 = 20 marks)

4. Answer the following questions:
 - 4A. Write short notes in Edge Effect and Integral Dose.
 - 4B. Write short notes in kilovoltage CBCT and megavoltage CBCT.
 - 4C. Discuss about the various terms used for specifying brachytherapy source strength.
 - 4D. What are the general guidelines for the patient positioning for external beam radiotherapy?
(5×4 = 20 marks)



MANIPAL UNIVERSITY**THIRD SEMESTER M.Sc. (MEDICAL RADIATION PHYSICS) DEGREE EXAMINATION – JANUARY 2014****SUBJECT: PHYSICS IN NUCLEAR MEDICINE**

Monday, January 06, 2014

Time: 10:00 – 13:00 Hrs.

Max. Marks: 80

 **Answer ALL the questions.**

1. With the help of neat and labelled diagram explain the working principle of gamma camera.
(10 marks)
2. Compare and contrast between the various detectors used in PET.
(10 marks)
3. Role of various collimators used in Nuclear Medicine.
(10 marks)
4. What is the role of delay tank and fumehood in radioiodine ward/layout?
(10 marks)
5. With the help of V-I characteristic curve explain the working principle of dose calibrator.
(10 marks)
6. **Write short notes on the following:**
 - 6A. Pocket dosimeter
 - 6B. Sensitivity
 - 6C. Calibration Sources
 - 6D. Phantoms
 - 6E. Scalloping Effect
 - 6F. Radionuclide Generators

(5×6 = 30 marks)



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MANIPAL UNIVERSITY

THIRD SEMESTER M.Sc. (MEDICAL RADIATION PHYSICS) DEGREE EXAMINATION – JANUARY 2014

SUBJECT: RADIATION SAFETY AND REGULATIONS

Wednesday, January 08, 2014

Time: 10:00 – 13:00 Hrs.

Max. Marks: 80

✍ Answer ALL questions.

1. List the duties of the Licensee for radiation equipment, RSO and the Employer. (20 marks)

2. Describe the design and planning of a Cobalt Teletherapy Treatment Room. (20 marks)

3. What are the aims of radiation protection? State the systems of dose limits in:
 - 3A. ICRP publications.
 - 3B. What are the responsibilities of Radiation Safety Officer in a Teletherapy Department? (10+10 = 20 marks)

- 4A. The exposure rate from a Cs 137 source is 120 cGy/hour. What is the thickness of lead required to reduce this exposure to 24 mGy/hour? (HVL 0.6 cm lead)
- 4B. Equivalent Dose and Effective Dose.
- 4C. Write a short note on A1 and A2 values for transport.
- 4D. What is contamination? How will you control it and what are the precautions to be taken to avoid it? (5×4 = 20 marks)

