

MANIPAL UNIVERSITY**SECOND YEAR M.Sc. N.M.T. DEGREE EXAMINATION – DECEMBER 2015****SUBJECT: PAPER II: NUCLEAR MEDICINE INSTRUMENTATION – II
(NEW REGULATIONS)**

Wednesday, December 16, 2015

Time: 10:00 – 13:00 Hrs.

Max. Marks: 80

✍ **Answer ALL the questions. Draw neat and labeled diagram as and when required.**

1. Does attenuation in counts significantly affect in SPECT imaging? What are the various attenuation correction techniques adopted? Explain
(20 marks)
2. As a technologist how can you assure the energy linearity of a gamma ray spectrometer?
(20 marks)
3. What is the requirement of normalization in PET? How is it done?
(10 marks)
4. In brief discuss on intrinsic spatial resolution of gamma camera.
(10 marks)
5. **Write short notes on the following:**
 - 5A. ADC
 - 5B. Partial volume effect
 - 5C. Ideal properties of a tracer
 - 5D. Image co-registration

(5 marks × 4 = 20 marks)



MANIPAL UNIVERSITY**SECOND YEAR M.Sc. NMT DEGREE EXAMINATION – DECEMBER 2015****SUBJECT: PAPER III: NON IMAGING NUCLEAR MEDICINE TECHNIQUES
(NEW REGULATIONS)**

Thursday, December 17, 2015

Time: 10:00 – 13:00 Hrs.

Max. Marks: 80

✍ **Answer ALL the questions.**

1. Write in Detail on followings:

- 1A. Separation system In RIA and IRMA – Need, desirable characteristics and various methods of suitable separation system.
- 1B. Radio isotopic RBC Total Plasma Volume Study – Principles, Methods and clinical applications.
- 1C. Requirements and performing Radio microbiological study - Radiotracers characteristics, Methods and Applications.
- 1D. Plasma Iron turns over Study – radiolabel characteristics, methods and applications.
- 1E. Autoradiography: Description, Types, methods and its applications.

(10 marks × 5 = 50 marks)

- 2A. What does scintillation cocktail in LSC consists of and explain the role of secondary solute?
- 2B. How thyroid uptake studies are conducted?

(10+5 = 15 marks)

- 3A. Explain the estimation of different errors in RIA.
- 3B. Assume gross count rate and back ground count rates of 900cpm and 100cpm respectively. What is the optimal division of a 1.25 min total counting time and the resulting uncertainty in the net sample counting rate.

(5+5 = 10 marks)

4. What is the importance of Compartment analysis in tracer kinetics?

(5 marks)



MANIPAL UNIVERSITY**SECOND YEAR M.Sc. NMT DEGREE EXAMINATION – DECEMBER 2015****SUBJECT: PAPER IV: IMAGING NUCLEAR MEDICINE TECHNIQUES
(NEW REGULATIONS)**

Friday, December 18, 2015

Time: 10:00 – 13:00 Hrs.

Max. Marks: 80

✍ Answer ALL questions:

1. What are the different methods to perform a cerebral blood flow study? Also give a brief description of different brain perfusion imaging agents that can cross the Blood Brain Barrier.
(20 marks)
2. Explain in detail the various methods used for labeling RBCs with ^{99m}Tc .
(20 marks)
3. A 40 yrs. old female patient suffering from carcinoma breast has been referred to the Dept. of Nuclear Medicine for a ^{99m}Tc MDP bone scan to rule out skeletal metastases. You have a whole body scanning device- moving patient table. Write about:
 - 3A. Pharmaceutical preparation
 - 3B. Patient preparation pre and post injection
 - 3C. Acquisition protocol
 - 3D. Scan findings showed diffusely increased soft tissue activity with poor visualization of skeletal system. This appearance raised a question of a technical problem. List the various factors that could have gone wrong.

(5 marks \times 4 = 20 marks)**4. Write short notes on:**

- 4A. ^{99m}Tc -HSA Vs ^{99m}Tc -MAA
- 4B. Fluorescent scanning of thyroid
- 4C. Cardiac imaging agents used in PET
- 4D. Adrenal Cortex Scintigraphy

(5 marks \times 4 = 20 marks)

MANIPAL UNIVERSITY
SECOND YEAR M.Sc. NMT DEGREE EXAMINATION – DECEMBER 2015

SUBJECT: PAPER V: THERAPEUTIC NUCLEAR MEDICINE PROCEDURES
(NEW REGULATION)

Saturday, December 19, 2015

Time: 10:00 – 13:00 Hrs.

Max. Marks: 80

✍ **Answer ALL the questions:**

1. What are the non-target organs in a patient who has been given high dose of ^{131}I ? How will you decrease the radiation dose to the non target organs and tissues? With a neat diagram describe the “dual delay tank” system for 2 patients.

(20 marks)

2. A female patient suffering from thyrotoxicosis has been referred to your department for ^{131}I therapy. How will you prepare the patient for the therapy? What is the importance of doing a ^{131}I Thyroid uptake study before you treat the patient with ^{131}I ?

(20 marks)

3. A male patient suffering from carcinoma of the prostate and having multiple painful bone metastasis has come to your department for palliation therapy:

- i) Enumerate the different radionuclides available to help this patient.
- ii) Enumerate the physical characteristics of the radionuclide which you would choose for therapy along with its advantages and disadvantages.
- iii) What precautions would you take while treating this patient to decrease the radiation hazard?

(20 marks)

4. **Write short notes on:**

4A. Treatment of Malignant Ascitis

4B. TLD

4C. Preparation of a bed ridden patient for high dose ^{131}I radioiodine therapy

4D. Radiation Synovectomy

(5 marks \times 4 = 20 marks)



MANIPAL UNIVERSITY**SECOND YEAR M.Sc. NMT DEGREE EXAMINATION – DECEMBER 2015****SUBJECT: PAPER VI: RADIATION BIOLOGY AND RADIATION PROTECTION
(NEW REGULATION)**

Monday, December 21, 2015

Time: 10:00 – 13:00 Hrs.

Max. Marks: 80

- ✍ **Answer ALL the questions.**
- ✍ **Students are instructed to answer Section – A and Section – B on the separate answer paper.**

SECTION – A: RADIATION BIOLOGY (30 MARKS)**1. Write short notes on:**

- 1A. Gastrointestinal Syndrome
- 1B. Deterministic Vs Stochastic effects of radiation
- 1C. Human Cell cycle and radiosensitivity
- 1D. Stages of Acute radiation syndrome
- 1E. LD 50/30

(6 marks × 5 = 30 marks)

SECTION – B: RADIATION PROTECTION (50 MARKS)**1. Answer the following:**

- 1A. Discuss the three general techniques for disposing radioactive waste.
- 1B. What is meant by a package? Explain TYPE A and TYPE B Packages.

(5 marks × 2 = 10 marks)

2. Answer the following:

- 2A. Nuclear Medicine lab which is also practicing I-131 therapy. What are the minimum requirements for the above work? What are the main features involved in planning a Nuclear Medicine lab? Give a typical plan of a category?
- 2B. Give some emergency situation in that may arise in Nuclear medicine department. How do they work? How can you prevent them?

(20 marks × 2 = 40 marks)

