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MANIPAL UNIVERSITY

SECOND YEAR M.Sc. N.M.T. DEGREE EXAMINATION – DECEMBER 2016

SUBJECT: PAPER II: NUCLEAR MEDICINE INSTRUMENTATION – II

(NEW REGULATIONS)

Friday, December 16, 2016

Time: 10:00 – 13:00 Hrs. Max. Marks: 80

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

1. In detail classify collimators and explain on each. (20 marks)

2. Explain on the correction methods adopted in PET system. (20 marks)

3. "SPECT has an edge over planar studies". Opine on this statement with reasons. (10 marks)

4. How can we assure the linearity of dose calibrator? (10 marks)

5. **Write short notes on the following:**

5A. Nonuniformity

5B. Data acquisition in PET

5C. Nyquist Frequency

5D. Quenching in GM counters

(5 marks × 4 = 20 marks)

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SECOND YEAR M.Sc. NMT DEGREE EXAMINATION – DECEMBER 2016

SUBJECT: PAPER III: NON IMAGING NUCLEAR MEDICINE TECHNIQUES

(NEW REGULATIONS)

Saturday, December 17, 2016

Time: 10:00 – 13:00 Hrs. Max. Marks: 80

Answer ALL the questions.

1. A patient has been admitted in the emergency department with a history of Burn of more than fifty percent. Patient refer to nuclear medicine for the estimating the:

1A. Estimating Plasma volume (PV) and Total blood volume (TBV) of the patient.

1B. To do In vivo cross matching of blood.

(20 marks)

2. Why RIA is called Competitive Protein binding immuno assays and IRMA is called Non Competitive Protein Binding Assays – Justify? Name the Reagents used for RIA. Represent Various ways of plotting the Standard Curve for RIA & IRMA.

(20 marks)

3. Describe Patient preparation, Sampling method, counting and calculating the C-14 Urea Breath Test Procedure to confirm the H.Pylori in the stomach.

(10 marks)

4A. What is quenching in liquid scintillation counters? How does it arise? Only list the corrective measures adopted?

4B. Why an optimum working distance is chosen during a thyroid uptake counting?

(10 + 5 = 15 marks)

5A. Explain the Effects of background in counting experiment.

5B. As an experiment, calculate the ratio of two source activity from independent counts taken for equal counting times (background is negligible).
Counts from Source 1-16265, counts from source 2 - 8192.

(5+5 = 10 marks)

6. Deduce the appropriate compartment model.

$dV_1/dt = k_{01}V_0 + k_{41}V_4 - k_{12}V_1 - k_{14}V_1$

$dV_2/dt = k_{12}V_1 - k_{23}V_2$; $dV_3/dt = k_{23}V_2 - k_{30}V_3$;

$dV_4/dt = k_{14}V_1 - k_{41}V_4 - k_{45}V_4$; $dV_5/dt = k_{45}V_4 - k_{50}V_5$

(5 marks)

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MANIPAL UNIVERSITY

SECOND YEAR M.Sc. NMT DEGREE EXAMINATION – DECEMBER 2016

SUBJECT: PAPER IV: IMAGING NUCLEAR MEDICINE TECHNIQUES

(NEW REGULATIONS)

Monday, December 19, 2016

Time: 10:00 – 13:00 Hrs. Max. Marks: 80

Answer ALL questions:

1. A 2 months old baby with a history of recurrent upper respiratory tract infection has been referred to the Dept. of Nuclear Medicine for a GER scan. Write about:

1A. Patient preparation
1B. Ideal pharmaceutical
1C. Acquisition protocol
1D. How will you calculate the percentage reflux?

(5 marks × 4 = 20 marks)

2. A 30 year old lactating female patient has been referred to rule out right PUJ obstruction. Discuss the patient preparation, the imaging protocol, image processing and Renogram patterns.

(20 marks)

3. A female patient suffering from carcinoma breast has been referred to the Department of Nuclear medicine for rule out skeletal metastases. You have a gamma camera with SPECT CT for imaging. Write about:

3A. Radio pharmaceutical preparation
3B. Patient preparation pre and post injection
3C. Acquisition protocol
3D. Interpretation of the study

(2+8+8+2 = 20 marks)

4. **Write short notes on:**

4A. Agents for myocardial infarct imaging
4B. Dual phase imaging in parathyroid Scintigraphy
4C. Patient preparation for 131I whole body scan
4D. Adrenal cortical imaging agents

(5 marks × 4 = 20 marks)

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MANIPAL UNIVERSITY

SECOND YEAR M.Sc. NMT DEGREE EXAMINATION – DECEMBER 2016

SUBJECT: PAPER V: THERAPEUTIC NUCLEAR MEDICINE PROCEDURES

(NEW REGULATION)

Tuesday, December 20, 2016

Time: 10:00 – 13:00 Hrs. Max. Marks: 80

✍ **Answer ALL the questions:**

✍ **Long questions:**

1. A 5 yrs. old child diagnosed to have pheochromocytoma has been referred to Nuclear Medicine department for 131-I MIBG therapy. How will you prepare the patient? Discuss the protocol for the same.

(20 marks)

2. Discuss the various I-131 dose selection strategies for the treatment of a patient suffering from thyrotoxicosis.

(20 marks)

3. A patient of follicular carcinoma thyroid underwent I-131 scan six weeks post-total thyroidectomy. The scan did not show any residual thyroid tissue and the neck count was similar to background. Discuss the reasons. Suggest and discuss an alternative radionuclide scan to detect the residual tissue.

(20 marks)

4. **Short Notes:**

4A. Compare 153-Sm and 186-Re

4B. Delay tank

4C. Law of Bergonie and Tribondeau

4D. Radiation protection measures after high dose I-131 therapy

(5 marks × 4 = 20 marks)

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SECOND YEAR M.Sc. NMT DEGREE EXAMINATION – DECEMBER 2016

SUBJECT: PAPER VI: RADIATION BIOLOGY AND RADIATION PROTECTION

(NEW REGULATION)

Wednesday, December 21, 2016

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. **Short Notes:**

1A. Direct & Indirect action of radiation on cell.

1B. Acute Radiation Syndromes.

1C. Radio sensitizers and Radio protectors.

1D. Compare probabilistic effects and certainty effects of radiation.

1E. Radiation induced Carcinogenesis.

(6 marks × 5 = 30 marks)

SECTION – B: RADIATION PROTECTION (50 MARKS)

- **Answer the following:**

1A. Define Effective dose and DAC.

1B. Explain how we can control Radiation hazard?

(5 marks × 2 = 10 marks)

- **Answer the following:**

2A. What is meant by a package? Explain briefly about different types of packages.

2B. Write in detail about the procedures in handling radioactive spills. How will you monitor contamination? Also, provide an outline of decontamination procedures in such a situation.

(20 marks × 2 = 40 marks)