

## ALL INDIA INSTITUTE OF MEDICAL SCIENCES

## M.D. NUCLEAR MEDICINE EXAMINATION

MAY 2012

All Questions are short answer type and are compulsory and each carries 10 Marks

Paper No. – II

Radiobiology, Radiopharmacy &amp; Dosimetry

Time allowed : 3 hours

Maximum Marks : 100

1. Enumerate in Tabular form the Radiopharmaceuticals for bone pain palliation. Discuss their relative merits and demerits. 10
2. Enumerate and discuss with examples the various Generator-based positron-emitting radionuclides and their clinical potentials. 10
3. From a single injection procedure from a new radiopharmaceutical, a nuclear medicine staff received a dose of 5 mSv to the extremities and 0.1 mSv to the whole body. Calculate how many such procedures can be performed by nuclear medicine staff in a year. 10
4. Write shorts notes on : 10
  - a) Advances in Pharmacologic Stress Agents for myocardial perfusion imaging  
Focus on Adenosine
  - b)  $^{14}\text{C}$ -Urea Breath Test
5. Write a note on Molecular PET and PET/CT Imaging of tumour cell proliferation using F-18 fluoro-L-thymidine and the complementary clinical advantages and disadvantages vis-a-vis FDG-PET/CT. Enumerate clinical significance of diffusely increased splenic uptake on FDG-PET. 10
6. Compare and contrast any two of the following with respect to radiopharmaceutical and pharmacokinetic characteristics and their implications for clinical imaging:
  - a)  $^{99\text{m}}\text{Tc}$  HMPAO and  $^{99\text{m}}\text{Tc}$  ECD
  - b)  $^{99\text{m}}\text{Tc}$  MDP and  $^{18}\text{F}$ -Fluoride.
  - c)  $^{99\text{m}}\text{Tc}$  MIBI & Tetrofosmin
7. What is the principle of ALARA and state with examples how is it ensured in routine practice? Write a short note on Personal Monitoring. 10
8. Discuss the duties of Radiation Safety Officer in a busy Nuclear Medicine Department of University Hospital. 10
9. Leukocyte labeling: discuss precautions labeling procedure and applications. 10
10. Difference between radionuclide, radiochemical, chemical and biological purity with suitable examples. 10

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Paper No. – III

Clinical Nuclear Medicine

Time allowed : 3 hours

Maximum Marks : 100

1. Handling of Clinical Emergencies in a Radionuclide Therapy Ward and Evolving Strategies for Prevention and Minimization of Radiation Exposure to the Attending Personnel. 10
2. How has the management of Medullary thyroid carcinoma changed with the advent of 18F-FDG and non 18F-FDG PET radiopharmaceuticals. Write a brief note on clinical molecular imaging of with 18F-DOPA and 18F-FET PET and PET/CT. 10
3. Current and future role of SPECT-CT and PET-CT in orthopedic conditions. 10
4. Pre-treatment work-up, therapy protocol and post-treatment follow up in patients for I-131 MIBG therapy. 10
5. Write short notes on : 10
  - a) Compare and contrast perfusion single photon emission computed tomography and metabolic PET with respect to providing same clinical information in brain Imaging.
  - b) PET myocardial perfusion imaging versus SPECT myocardial perfusion imaging : Advantages and Limitations of each modality.
6. Quantification and Interventions in Hepatobiliary Scintigraphy and their clinical utilities. 10
7. Write short notes on : 10
  - a) Antenatal detection of PUJ stenosis & its management.
  - b) Role of I-123 MIBG in heart.
8. Describe in detail regarding interventional procedures in Nuclear Medicine. 10
9. Role of PET/CT in pediatric malignancy. 10
10. Role of thyroid scan & perchlorate discharge test in children. 10

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Paper No. – IV

Recent Advances in Nuclear Medicine

Time allowed : 3 hours

Maximum Marks : 100

1. ✓ Pre-treatment work-up, therapy protocol and post-treatment follow up in patients for Peptide Receptor Radiopharmaceutical Therapy. 10
2. ✓ Enumerate the hypoxia imaging tracers with PET, their mechanism for hypoxia imaging and clinical usefulness? 10
3. ✓ Brain Amyloid Imaging: the radiopharmaceuticals, methodologies and their shortcomings. 10
4. ✓ Write short notes on : 10
  - ✓ a) Solid-state detectors in nuclear cardiology.
  - b) Breast specific Imaging Technique in Nuclear Medicine.
5. ✓ Role of multimodality imaging in translational research. 10
6. ✓ Write short notes on : 10
  - ✓ a) Aptamers
  - b) Infection & Inflammation Imaging.
7. ✓ Write Short note on PET/CT in coronary artery disease. 10
8. ✓ Write in detail about various parathyroid imaging procedures. 10
9. ✓ Describe in brief PET/MR vs PET/CT. Discuss the Pros and Cons of each modality. 10
10. Describe and discuss the quantitative softwares used for Brain & Heart imaging. 10

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Paper No. - I

Basic Sciences and Instrumentation -

Time allowed : 3 hours

Maximum Marks : 100

1. Describe with examples, the principle of operation and working of gas-filled radiation detectors used in a Nuclear Medicine facility. 20
2. Image registration and fusion in Nuclear Medicine. 10
3. Write short notes on : 20 (5x4)
  - a. State the principle of Bayes' Theorem and describe its application in Nuclear Medicine
  - b. Student 't' test,
  - c. Chi square test,
  - d. McNemar Test.
4. Describe in brief the Physical Principles, Attenuation Correction and Quality Assurance of SPECT/CT 10
5. Write short notes on : 10 (18)
  - a. Bremsstrahlung
  - b. Common Artifacts Scan in SPECT Imaging & the Correlative measures. imaging.
  - c. Thyroid uptake Probe- Justify its utility in this era.
  - d. Various Collimators used in Nuclear Medicine Imaging and factor affecting collimator sensitivity & resolution.
6. Compare and contrast in Tabular format the physical properties of commonly used scintillators in Nuclear Medicine and discuss their role as optimum crystal for positron emission tomography? 10
7. Describe the principle of working of a cyclotron used for Nuclear Medicine with diagram. 10
8. Factors affecting quantitative PET measurements. 10