

ALL INDIA INSTITUTE OF MEDICAL SCIENCES

Speciality : M.D. (Nuclear Medicine)

Paper – IV

Month and year : December, 2009

Time : 3 hours

Max. Marks : 100

All Questions are compulsory. All question carry equal marks.

S.No.	Questions	Marks Allotted
1.	Write in detail about Sodium Iodide Symporter	10
2.	SPECT/CT usefulness in current practice and Discuss the definitive indications.	10
3.	Evaluation of Brain Tumors through SPECT & PET and Subsequent management.	10
4.	Current status of PET-MR. How will it score over other hybrid Imaging techniques.	10
5.	Role of Nuclear Medicine in Emergency Room Practice.	10
6.	Role of PET-CT in Radiotherapy Planning (i.e. Radiation Treatment)	10
7.	Positron emission Mammography.	10
8.	Therapy options with for medullary Carcinoma thyroid.	10
9.	Dementia imaging with radiopharmaceuticals.	10
10.	Radioiodine for Thyrotoxicosis in puberty.	10

ALL INDIA INSTITUTE OF MEDICAL SCIENCES

Speciality : M.D. (Nuclear Medicine)

Paper – III

Month and year : December, 2009

Time : 3 hours

Max. Marks : 100

 All Questions are compulsory. All question carry equal marks.

S.No.	Questions	Marks Allotted
1.	Algorithmic evaluation of Solitary Thyroid Nodule and subsequent management.	10
2.	Stress techniques in the evaluation of Coronary Artery Disease..	10
3.	Short note on : (i) Lymphoscintigraphy (ii) Parathyroid imaging (iii) Modified PLOPED Criteria (iv) Role of first Pass study.	20 (4x5)
4.	Role of SPECT/PET in Epilepsy	10
5.	Importance of interventional studies. Tabulate various interventions In NM. Discuss upon one in detail.	10
6.	Role of NM in infection & inflammation imaging.	10
7.	Gastric emptying time standardization and clinical utility	10
8.	Discuss Hepatic perfusion index and hepatic extraction fraction	10
9.	Options for bone pain palliation	10
10.	Sentinel node imaging concepts and write in detail the role in head & neck malignancy.	10

ALL INDIA INSTITUTE OF MEDICAL SCIENCES

Speciality : M.D. (Nuclear Medicine)

Paper - II

Month and year : December, 2009

Time : 3 hours

Max. Marks : 100

 All Questions are compulsory. All question carry equal marks.

S.No.	Questions	Marks Allotted
1.	Non-Fluorinated PET radio-pharmaceuticals	10
2.	Radioactive waste disposal	10
3.	Acute radiation syndrome ✓	10
4.	Artificial production of radionuclide ✓	10
5.	Generator based PET radiopharmaceuticals & their uses.	10
6.	What is the radiation burden due to PET/CT study? How does it compare with contrast enhanced CT? How can radiation burden be decreased in PET/CT studies?	10
7.	Radiopharmaceuticals for radio synovectomy. ✓	10
8.	Giving examples enumerate various equilibrium between parent and Daughter isotopes. ✓	10
9.	What is the role of bifunctional chelates labeling of pharmaceuticals?	10
✓ 10.	A therapeutic radiopharmaceutical is developed. What are the various steps before the product is available for commercial use?	10

ALL INDIA INSTITUTE OF MEDICAL SCIENCES**Speciality : M.D. (Nuclear Medicine)****Paper - I****Month and year : December, 2009****Time : 3 hours****Max. Marks : 100**

All Questions are compulsory. All question carry equal marks.

S.No.	Questions	Marks Allotted
1.	Radiosensitizers & Radioprotectors.	10
2.	How does one identify the critical organ of a new radiopharmaceutical?	10
3.	Monitoring and preventive practices in a cyclotron facility.	10
4.	Quality control of a dose calibrator	10
5.	Compare various PET Crystals	10
6.	Daily QC test for a SPECT/CT Scanner.	10
7.	Write briefly on "Personal Monitoring".	10
8.	Binomial, Gaussian & Poisson distribution.	10
9.	Radiation units in Nuclear Medicine.	10
10.	Working principles of accelerators	10

Max. marks : 100

Time : 3 hours

questions are compulsory.

Briefly mention the indications of PET/PET-CT study. 20

Write short notes on: 20

- a) Thyroid uptake studies
- b) Quantitative parameters in a tempered Renogram
- c) Direct Isotope cystography
- d) Hepatic extraction fraction

A 30 year old pregnant lady shows symptoms and signs of thyrotoxicosis. How would you proceed to investigate and treat her? 20

Write short notes on: 40

- a) Esophageal transit time
- b) Quantitation of salivary function
- c) Samarium 153 EDTMP
- d) Cardiac imaging with isotopes in diabetic patients

Max. marks : 100

Time : 3 hours

Attempt all questions.

PET Scintigraphy beyond ^{18}F FDG 25

Radionuclide procedures useful in various organ transplantation. 25

Write short notes on: 5x10=50

- i) Aerosol imaging of the lungs
- ii) Chernobyl disaster & incidence of thyroid cancer
- iii) Procedure useful for labeling components of the human blood with specific examples.
- iv) Co-registration imaging and its uses
- v) Three phase bone scanning.

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M.D. (Nuclear Medicine)
May 2005 Examinations

Paper II

Time : 3 hours
Max. Marks: 100

Attempt all questions

(Marks allotted)

- Q.1. Describe the mechanism of localization of PET radiopharmaceutical ? (20)
- Q.2. Describe the radiation protection practice in Nuclear Medicine with special reference in radioiodine therapy of Ca thyroid ? (20)
- Q.3. Write short notes on : (10 x 6)

- a) Oxygen Enhancement Ratio
- b) Direct & Indirect effect of radiation
- c) Radiation in Pregnancy
- d) Biodosimetry
- e) Transient radioactive equilibrium
- f) Radiopharmaceuticals in Emergency Nuclear Medicine procedures.

Handwritten notes:
 → type 7
 → ICRP
 → ALAR
 → NIM

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LCD → Liquid Crystal Display

M.D. (Nuclear Medicine)
May 2005 Examinations

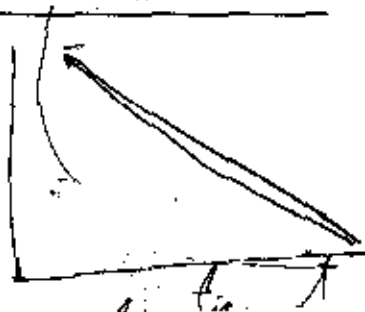
Paper I

Time : 3 hours
Max. Marks: 100

Attempt all questions

(Marks allotted)

- Q.1. Describe physical principles of PET imaging. How are randoms and scatter events corrected? (20)
- Q.2. Describe the interactions of radiation with matter with its relevance in Nuclear Medicine? (20)
- Q.3. Write short notes on: (10 x 6)
- Fan Beam collimator
 - Pulse height analyzer.
 - Specific absorbed fraction ←
 - Chi square test
 - Working principle of Medical Cyclotron
 - Image quality in SPECT



All India Institute of Medical Sciences

MD (Nuclear Medicine) Examination
December 2004

Paper - IV

Time : 3 hours
Max. marks: 100

questions are compulsory.

Viability of PET in Indian Scenario? Will you prefer SPECT-CT over PET-CT if yes Justify 20

Write Short note on : 20

- Infection Imaging, special reference to AIDS
- Scintigraphic techniques to detect and localize parathyroid pathology.
- Cystemography
- Thyroiditis

What are the diagnostic and therapeutic options in patients with negative I^{131} whole body imaging but with persistent elevated serum thyroglobulin (Tg) levels in cancer Thyroid 20

Write short notes on: (Any Five) 40

- Neuro-imaging in patients with head injury
- Recent advances in radionuclide therapy
- Imaging and therapeutic applications of NaI (NIS) Symporter
- Imaging for avascular necrosis of femoral head
- Role of attenuation correction in myocardial perfusion imaging
- Co-registration imaging and its utility in Nuclear Medicine

All India Institute of Medical Sciences
D (Nuclear Medicine) Examination
December 2004

Paper - III

Time : 3 hours
Max. marks: 100

All questions are compulsory.

Briefly describe the following

4 x 10 = 40

- Radionuclide evaluation of GI Bleeding.
- Quantitative cholescintigraphy
- Renography and its modifications .
- Radionuclides for metastatic bone pain palliation

Modalities of treatment available for Thyrotoxicosis. Discuss in detail the role of I-131 therapy in the management of Thyrotoxicosis. (20)

Write Short Notes:

(4 x 10 = 40)

- a) Pharmacological Stress Techniques in assessment of Coronary Artery Disease.
- b) Pulmonary Embolism - PIOPED
- c) Helicobacter Pylori breath test
- d) Neuro receptor Imaging

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II (Nuclear Medicine) Examination
December 2004

Paper - II

Time : 3 hours
Max. marks: 100

All questions are compulsory.

Write Short notes on:

5 x 8 = 40

- Autoradiography
- Artificial production of radionuclides
- Radiation monitoring - principles elaborate upon various personal monitors.
- Chemical methods of detecting impurities TcO_4 Sol
- PET radiopharmaceuticals

Discuss in detail the mechanism of localization of radiopharmaceuticals. Enumerate the radiopharmaceuticals that get metabolically localized in various organs.

20

Write Short notes on :

4 x 5 = 20

- Factors affecting Cr-51 red blood cells labeling efficiency
- Low dose radiation effects in-utero
- Law of Bergonie & Tribondeau
- Factors influencing counting of radioactivity.

Give Reasons:

5 x 4 = 20

- Tc^{99m} sulfur colloid should not be heated excessively
- Perchlorate administration improves the quality of brain scan with $^{99m}TcO_4$
- Tc^{99m} aerosols are better than Xe-133 in the evaluation of obstructive Pulmonary disease

All India Institute of Medical Sciences

MD (Nuclear Medicine) Examination
December 2004

Paper - I

Time : 3 hours
Max. marks: 100

All questions are compulsory.

- Q1 Describe the principle of gas filled detectors. Discuss their day-to-day use in Nuclear Medicine Practice. 20
- Q2 1) What is gamma ray constant? Find out the exposure rate for 100 mCi of Iodine 131 at 0.5 meter distance
2) Derive the relationship between decay constant and half-time. 20
- Q3 Briefly describe: (Any Six) 6 x 10 = 60
- a) TLD Personal Monitoring
 - b) Annihilation Radiation
 - c) Gamma Ray Spectrometry
 - d) Phantoms and the importance
 - e) Radioactive waste disposal
 - f) Importance of Filters in Camera systems in special reference to SPECT
 - g) Quality control in RIA laboratory
 - h) Radiation syndrome.
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ALL INDIA INSTITUTE OF MEDICAL SCIENCES

M.D.Nuclear Medicine
May 2004

Paper: IV

Time: Three hour

Maximum Marks:100

- Q 1. Discuss the role of Nuclear Medicine Procedures in surgical emergencies (10 marks)
- Q 2. What is the significance of interventions in Nuclear Medicine. Enumerate various procedures and describe one of these in detail (20 marks)
- Q 3. How helpful is FDG-PET/CT in staging and management of patients with lymphoma ? (20 marks)
- Q 4. Write notes on any five of following? (50 marks)
- (a) Imaging joints for synovectomy evaluation.
 - ✓ (b) Immunoscintigraphy in Ca-Breast.
 - ✓ (c) Evaluating rejection of a cardiac transplant.
 - ✓ (d) Role of Gated Myocardial Perfusion SPECT in Cardiomyopathy.
 - ✓ (e) Radio-receptor assay.
 - ✓ (f) Role of Nuclear Medicine in AIDS
 - ✓ (g) Infection Imaging

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M.D.Nuclear Medicine
May 2004

Paper: III

Time: Three hour

Maximum Marks:100

Q 1. Write short notes on any FIVE of the following? (50 Marks)

- (a) Diabetic renography.
- (b) Parathyroid Imaging.
- (c) Glomerular Filtration Rate.
- ✓(d) Sr ⁸⁹ vs P³² Vs Sm ¹⁵³ for bone palliation therapy.
- (e) Blood clot detection.
- ✓(f) Hibernating Myocardium.
- (g) Soft tissue tumors imaging.
- ✓(h) Inter-relationship of Serum Thyroxin with Serum TSH in Hypothyroid patients. 94
- (i) Stress fractures of bone.

Q 2. Compare and Contrast Nuclear Medicine ,Ultrasound and Computed Tomography in evaluation of hepaato-billary disorders (20 marks)

✓Q3. Brain SPECT/PET in evaluating and management of Dementia? (15 marks)

Q4 Justify that management of cancer thyroid is multidisciplinary (15 marks)

ALL INDIA INSTITUTE OF MEDICAL SCIENCES

M.D. Nuclear Medicine

May 2004

Paper: II

Time: Three hours

Maximum Marks: 100

Q1. Differentiate radiochemical from radiopharmaceuticals and explain with examples the mechanism of localization of radiopharmaceuticals? (20 Marks)

Q 2. Describe the various mode of decay of radionucleides with suitable examples and also explain the decay of Te-131 to I-131? (20 Marks)

Q3. Write Short Note on (Any Four) (20 Marks)

- ✓ 1. Radiation Hormosis
- ✓ 2. Schilling Test
3. Radiorespirometry
- ✓ 4. Safe Disposal of radioactive waste
- ✓ 5. SI units in radiation measurement

Q4. Define & explain any four of the following? (20 Marks)

- ✓ (a) Relative biological effectiveness
- ✓ (b) Detriment in a population
- (c) Collisional power
- (d) Effective dose
- ✓ (e) Exposure rate constant

Q5. In health care facilities where radiation is used for diagnostic & therapeutic purposes protection of four groups of people may need to be considered Specify and justify regulatory & operational dose equivalent limits for the four groups and compare them to dose equivalent from natural background? Briefly describe recent ICRP recommendations. (20 Marks)

- (a) Atomic radiation workers (ARWs)
- (b) Radiation workers who are not ARWs.
- (c) Non radiation workers
- (d) Public at large.

N-2 P-4

ALL INDIA INSTITUTE OF MEDICAL SCIENCES

M.D.Nuclear Medicine
May 2004

Paper: I

Time: Three hours

Maximum Marks:100

Q 1: What Collimators would you select for each of the following procedures?
Explain the reasons of your choice. (25 marks)

1. Tear duct scintigraphy.
2. First pass angiography.
3. Images of the knee using Ga-67 citrate ("spot views").
4. ^{131}I Uptake

Q 2: Briefly define and explain the use or the significance? (Any six) (30 Marks)

1. Coincidence Imaging ✓
2. Flash ADC ✓
3. Auto tune ✓
4. Slip ring ✓
5. Pileup correction ✓
6. Fan beam focal length ✓
7. Holo spectral Imaging ✓
8. Truncation artifacts ✓
9. Cross-talk contamination ✓
10. 3-D mode of PET scanner. ✓

Q 3: Describe the effect of Crystal thickness on intrinsic spatial resolution,
System spatial resolution without scatter, and system sensitivity for
Tc- 99m & I-131 (15 Marks)

Q 4: Briefly define or explain the use of (35 Marks)

- 1. Bilinear interpolation ✓
- 2. Levenberg-Marquardt algorithm ✓
- 3. Histogram equalization ✓
4. Biexponential fitting ✓
5. Gaussian smoothing ✓
6. Fluorescent Scanning ✓
7. Neutron Activation Analysis ✓

All India Institute of Medical Sciences

M.D. Nuclear Medicine

May 2003

Paper : I

Time : 3 hours

M. Marks : 100

I. Write short notes on:

4

100

- i) Alara.
- ii) Attenuation correction.
- iii) Photo electric effects.
- iv) Filters in spect imaging.
- v) Cyclotron produced radiopharmaceuticals.
- vi) Working principle of accelerators.
- vii) Sensitivity; specificity; negative & positive predictive values.
- viii) Poisson and Gaussian distribution.
- ix) Liquid scintillation counting.
- x) ICRP Recommendations.

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M.D. Nuclear Medicine

May 2003

Paper : II

Time : 3 hours
M. Marks : 100

1. Write short note on any ten of the following: 25
- a) ~~isotone; Isotope; Isobar; isomers.~~
 - b) ~~Energy units ev; kev; Mev.~~
 - c) ~~Negalin (β minus) decay.~~
 - d) ~~Compton scatter.~~
 - e) ~~Distinction between Radionuclides, Radio chemicals & Radio pharmaceuticals.~~
 - f) ~~Physical, Biological & Effective half life & their relationship.~~
 - g) ~~Radiocolloids - Varieties & applications.~~
 - h) ~~Cheniosophon.~~ ✓
 - i) ~~Radio nuclide purity.~~
 - j) ~~Transient equilibrium.~~
 - k) ~~Inverse square law.~~
 - l) ~~Half value layer.~~
2. Give an account of non-fluorinated PET RP. 25
3. Rationalize the purpose of radiation monitoring. Enumerate the principal & function of various personal monitors. 25

All India Institute of Medical Sciences

M.D. Nuclear Medicine
May 2003

Paper : III

Time : 3 hours
M. Marks : 100

1. Describe the role of nuclear medicine in a case of pyrexia of unknown origin.
2. Write short note on:
 - a) Lymphoscintigraphy.
 - b) Quantitative hepato biliary studies.
 - c) Renal transplant evaluation.
 - d) FDG imaging in oncology.
 - e) Sentinal node imaging.
 - f) Thyroid stunning.
 - g) Role of nuclear medicine in GI bleeding.
 - h) Role of radioisotopes in bone pain palliation.
 - i) Radionuclide ventriculography. Relavance in today's cardiology.
 - j) Modified Renography
3. Describe the technique of myocardiac perfusion imaging. Critically evaluate Tc labeled comp & Thall in IHD.

All India Institute of Medical Sciences

M.D. Nuclear Medicine
May 2003

Paper : IV

Time : 3 hours
M. Marks : 100

1. Therapeutic applications of radioisotopes in non-oncological disorders.
2. Discuss role of radionuclide imaging vs 2D Echocardiography in evaluation of IHD.
3. ○ Assessment of myocardial innervation by nuclear techniques.
4. ○ Radio synovectomy of large joints.
5. Role of Nuclear Medicine in evaluation of epilepsy.
6. ○ Radio immunotherapy, its limitation & achievements.
7. Should India get PET scanners & its relevances.
8. > What is a Hybrid camera; Describe their principal & utility.
9. Review Advance in Thyroid Ca management.
10. Role of Nuclear Medicine in Emergency.