

MANIPAL UNIVERSITY

THIRD YEAR B.Sc. N.M.T. DEGREE EXAMINATION – JUNE 2008

SUBJECT: IMMUNOLOGY, RADIOIMMUNOASSAY AND COUNTING STATISTICS

Monday, June 16, 2008

Time: 3 Hrs.

Max. Marks: 80

- ✍ **Answer ALL the questions. Draw diagrams and flow charts wherever appropriate.**
 ✍ **USE TWO SEPARATE ANSWER BOOKS FOR SECTION 'A' & SECTION 'B'.**

SECTION – 'A': IMMUNOLOGY, RADIOIMMUNOASSAY: 50 MARKS

1. Write short notes on any **FOUR**:
 - 1A. Biological functions of Immunoglobulins
 - 1B. Affinity and Avidity
 - 1C. Delayed Hypersensitivity
 - 1D. Theories of Antibody Synthesis
 - 1E. RIA as an in vitro immunological technique

(5×4 = 20 marks)

2. Write short notes on any **SIX**:
 - 2A. Dose response curve
 - 2B. Comparison of RIA and IRMA
 - 2C. Chemiluminescence assay
 - 2D. Fluoroimmunoassay
 - 2E. Principle of RIA
 - 2F. Principle of IRMA
 - 2G. Statistical parameters in RIA

(5×6 = 30 marks)

SECTION – 'B': COUNTING STATISTICS: 30 MARKS

- ✍ **Answer all the questions.**

3. Which are the measures of central tendency? For the given data, find the value of each of them.

8, 12, 2, 6, 8, 9, 4, 7, 11, 10

(1+4 = 5 marks)

4. Certain pesticide is packed into bags by a machine. A random sample of 10 bags is drawn and their contents are found to weigh as follows:

50, 49, 52, 44, 45, 48, 46, 45, 49, 45

Test if the average packing can be taken to be 50kg.

(Tabulated $t_{0.05}$ for 9 degree freedom = 2.262)

(5 marks)

5. Show that the coefficient of correlation is independent of scale and origin of the variables. (5 marks)

- 6A. Define sensitivity and specificity.
6B. Calculate sensitivity in the following

Test Result

	-	+
Well	836 = TN	44 = FB
Ill	26 = FN	94 = TP

($2\frac{1}{2} \times 2 = 5$ marks)

- 7A. How can we divide the total time for counting background counts and gross sample counts so as to have minimum error in the net count rate?
7B. Write down the general formula for the propagation of errors and derive the formula for the error propagation in multiplication of two data.

($5 \times 2 = 10$ marks)



MANIPAL UNIVERSITY**THIRD YEAR B.Sc. N.M.T. DEGREE EXAMINATION – JUNE 2008****SUBJECT: RADIATION BIOLOGY AND IN VITRO NUCLEAR MEDICINE**

Tuesday, June 17, 2008

Time: 3 Hrs.

Max. Marks: 80

✍️ **Answer all the questions.****SECTION – 'A' : RADIATION BIOLOGY : 30 MARKS****1. Short Notes:**

- 1A. Linear Quadratic model.
- 1B. Stochastic and Deterministic effects.
- 1C. Hematopoietic syndrome.
- 1D. Cellular injury due to radiation.
- 1E. Compton scatter.
- 1F. Free Radical

(5×6 = 30 marks)

SECTION – 'B' : IN VITRO NUCLEAR MEDICINE : 50 MARKS✍️ **Long answers:**

2. Write in detail the compartmental analysis including the mathematical representation of the model.

(15 marks)

3. A female patient is suffering from chronic anemia has been referred to the department of Nuclear Medicine to rule out Vitamin B12 deficiency due to Intrinsic factor deficiency. Write in details.

- 3A. Physical property of the radionuclides used for Schilling test I and II.
- 3B. Procedure protocol and patient preparation for Schilling test I and II

(5+10 = 15 marks)

4. Write short notes on any FOUR.

- 4A. Organisms detected by radiometric method factors affecting radiometric detection of bacterial metabolism.
- 4B. Detection of radiocarbon.
- 4C. Plasma Iron clearance.
- 4D. Ideal characteristics of tracer to be used for blood volume estimation.
- 4E. Neutron activation analysis.

(5×4 = 20 marks)



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MANIPAL UNIVERSITY

THIRD YEAR B.Sc. N.M.T. DEGREE EXAMINATION – JUNE 2008

SUBJECT: NUCLEAR MEDICINE INSTRUMENTATION

Wednesday, June 18, 2008

Time: 3 Hrs.

Max. Marks: 80

1. Write notes on:
 - 1A. Imaging processing in SPECT.
 - 1B. Scattered Radiation Effect in SPECT.
 - 1C. Role of Filters in SPECT.
 - 1D. Applications of SPECT in Nuclear Medicine.

(20 marks)

2. Derive basic equation on which a Medical cyclotron Works.

(20 marks)

3. Explain the principle of Liquid Scintillation Counters and Wholebody Counters. How Liquid Scintillation Counters and Wholebody counters are useful in Nuclear Medicine?

(20 marks)

4. Write short notes on:
 - 4A. Magnetic Resonance Imaging (MRI).
 - 4B. Q.C. Tests of SPECT Gamma Camera.
 - 4C. Computed Tomography (CT)
 - 4D. PET-Radiopharmaceuticals and their applications.

(5×4 = 20 marks)



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MANIPAL UNIVERSITY
THIRD YEAR B.Sc. N.M.T. DEGREE EXAMINATION – JUNE 2008
SUBJECT: RADIOPHARMACY – II

Thursday, June 19, 2008

Time: 1½ Hrs.

Max. Marks: 40

1. Write in details about ^{99m}Tc Brain agents.

(10 marks)

2. Mention the various Bone radiopharmaceuticals used in the past. Explain the ^{99m}Tc radiopharmaceuticals for the same. Add a note on their advantage over earlier Radiopharmaceuticals.

(2+6+2 = 10 marks)

3. Write short notes on:
 - 3A. Thallium 201.
 - 3B. Radiation Synovectomy Radiopharmaceuticals.
 - 3C. F-18.
 - 3D. Principles of Radioiodination.

(5×4 = 20 marks)

