

# MANIPAL UNIVERSITY

## SECOND YEAR B.Sc. N.M.T. DEGREE EXAMINATION – DECEMBER 2007

SUBJECT: FUNDAMENTALS OF ELECTRONICS AND NUCLEAR MEDICINE INSTRUMENTATION

Monday, December 10, 2007

Time: 3 Hrs.

Max. Marks: 80

ANSWER SECTION – A AND SECTION – B IN TWO SEPARATE ANSWER BOOKS.

### SECTION – A : FUNDAMENTALS OF ELECTRONICS : 30 MARKS

Answer any SIX questions of the following.

Draw suitable circuit diagram, block diagram, waveform or characteristics wherever it is necessary.

1. Write a short note on series and parallel connection of capacitor. (5 marks)
2. Explain the full wave rectifier. (5 marks)
3. Explain the Single Channel Analyzers in PHAs. (5 marks)
- 4A. What is intrinsic and extrinsic semiconductor?
- 4B. Write a short note on working of NPN transistor. (2+3 = 5 marks)
5. Explain how an OP-AMP can be used for following application with the circuit diagram and Expression    i) Inverting    ii) Integrator (5 marks)
6. Using binary Multiplication rule find the product of  $(10100)_2 \times (101)_2$  and binary subtraction rule, find  $(1011)_2 - (1001)_2$  and convert answer into decimal. (5 marks)
- 7A. Explain Ohm's law.
- 7B. Write a short note for NAND and OR gate. (2+3 = 5 marks)

### SECTION – B: NUCLEAR MEDICINE INSTRUMENTATION: 50 MARKS

Answer all questions.

8. Describe the working principle of Scintillation Camera with a neat and labeled diagram. (20 marks)
9. Write in detail note on Semiconductor detectors. (20 marks)
10. Answer for any TWO:
  - 10A. Pulse Height Analyzer.
  - 10B. NaI (TI) crystal.
  - 10C. Single channel analyzer. (5×2 = 10 marks)



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**SECOND YEAR B.Sc. N.M.T. DEGREE EXAMINATION – DECEMBER 2007**

**SUBJECT: RADIATION CHEMISTRY AND RADIATION PHYSICS**

Tuesday, December 11, 2007

Time: 3 Hrs.

Max. Marks: 80

Answer Section – 'A' and Section – 'B' in TWO Separate Answer Books.

**SECTION – A : RADIATION CHEMISTRY : 30 MARKS**

1 Write short notes on:

- 1A. Miscible and Immiscible liquids.
- 1B. Reversible and Irreversible reaction.
- 1C. pH and Buffers.
- 1D. Bohr's model.
- 1E. Atomic and Molecular weight.
- 1F. Solutions and solubility.

(5×6 = 30 marks)

**SECTION – B : RADIATION PHYSICS : 50 MARKS**

2. Answer any **TWO**:

- 2A. What are the different modes of decay? Explain alpha decay and beta decay.
- 2B. Define half value layer. If the HVL of Tc-99m is 0.3 mm of lead, calculate the linear attenuation coefficient of lead for 140 keV photons and the amount of lead needed to reduce the exposure of a point source of radiation of Tc-99m by 70%.
- 2C. How do charged particles (alpha and beta) interact with matter? Explain.

(5×2 = 10 marks)

3. Answer the following:

- 3A. i) Describe Bohr's atomic model.
- ii) Define Isotopes, Isotones, Isobars and Isomers with example.

(15+5 = 20 marks)

3B. How do gamma rays interact with matter? Explain each interaction.

(20 marks)



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## MANIPAL UNIVERSITY

**SECOND YEAR B.Sc. N.M.T. DEGREE EXAMINATION – DECEMBER 2007**

**SUBJECT: RADIOPHARMACY**

Wednesday, December 12, 2007

Time: 1½ Hrs.

Max. Marks: 40

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

1. Define a radiopharmaceutical with ideal characteristics for diagnostic and therapeutic radiopharmaceuticals. Give examples for each.

(10 marks)

2. Explain the principle behind the secondary production of radionuclides.

(10 marks)

3. Write short notes on the following:

3A. Toxicity and Biodistribution of radiopharmaceuticals.

3B. Exposure and Absorbed Dose.

3C. Fick Principle and Clearance Technique

3D. Neutron Activation.

(5×4 = 20 marks)

