

**MANIPAL UNIVERSITY****SECOND YEAR B.Sc. N.M.T. DEGREE EXAMINATION – JUNE 2009****SUBJECT: FUNDAMENTALS OF ELECTRONICS AND NUCLEAR MEDICINE INSTRUMENTATION**

Monday, June 01, 2009

Time: 10:00-13:00 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. The resistors of  $45 \Omega$  and  $67.5\Omega$  are respectively connected in series across a source of 240V. Calculate: i) Circuit current ii) Voltage drop in each resistors.

(5 marks)

2A. Write a short note on conductor and insulator.

2B. Explain p-n junction as a diode.

(2+3 = 5 marks)

3A. Write a short note on U.P.S.

3B. Explain half-wave rectifier.

(2+3 = 5 marks)

4. Explain P.M.T.

(5 marks)

5A. Explain symbol of Op-Amp.

5B. Explain Ex-OR gate and OR gate.

(2+3 = 5 marks)

6A. Find binary subtraction of  $(1101101)_2 - (100101)_2$  and convert answer into decimal.6B. Convert 420, 0.75 into binary and find the product of  $(1101101)_2 \times (101)_2$ .

(2+3 = 5 marks)

7A. Write a short note on ADC and DAC.

7B. Write a short note on doping in semiconductor.

(2+3 = 5 marks)

SECTION – B: NUCLEAR MEDICINE INSTRUMENTATION: 50 MARKS

✍ Answer **ALL** questions.

8. Give reasons for the following:

8A. Uniformity correction in Gamma Camera.

8B. Magnified images are obtained in pinhole collimator.

8C. Need of QC test in Dose Calibrator.

8D. Collimator's resolution may be expressed as its angle of acceptance.

(5×4 = 20 marks)

9. Explain how the positioning circuit improves resolution of Gamma camera.

(20 marks)

10. Write short notes on:

10A. Bar Phantom.

10B. Intrinsic Efficiency.

(5×2 = 10 marks)



**MANIPAL UNIVERSITY**  
**SECOND YEAR B.Sc. N.M.T. DEGREE EXAMINATION – JUNE 2009**  
**SUBJECT: RADIATION CHEMISTRY AND RADIATION PHYSICS**

Tuesday, June 02, 2009

Time: 10:00-13:00 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. Acids and Bases.
- 1B. Bohr's Atomic Model.
- 1C. Wave nature of electrons.
- 1D. Ionic bond.
- 1E. Law of Mass action.
- 1F. Heisenburg's Uncertainty Principle.

(5×6 = 30 marks)

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

**2. Answer any TWO:**

- 2A. Define physical half-life, biological half-life and effective half-life.
- 2B. How is Bremsstrahlung produced? Does its production increase or decrease with increasing kinetic energy of the electron and atomic number of the absorber? Explain why P-32 is stored in plastic container.
- 2C. Explain the principle and operation of Geiger Muller counters.

(5×2 = 10 marks)

**3. Answer the following:**

- 3A. How are radionuclides produced in a reactor and what are their characteristics?
- 3B. How do gamma rays interact with matter? Explain each interaction.

(20×2 = 40 marks)



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**MANIPAL UNIVERSITY**  
**SECOND YEAR B.Sc. N.M.T. DEGREE EXAMINATION – JUNE 2009**  
**SUBJECT: RADIOPHARMACY – I**

Wednesday, June 03, 2009

Time: 10:00-11:30 Hrs.

Max. Marks: 40

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

1. On arrival of new cold kits to the department during stock checking by chance you left one kit of DTPA in the reception counter and after one week you found it. As a Radiopharmacist can you use this kit for patient use? Justify.

(10 marks)

2. Two consignments of  $^{131}\text{I}$ -sodium iodide of 300mCi in 2ml (each) at 10hrs arrived in the department at 8:30hrs. Patients scheduled for ablation therapy are (a) two patients for 150mCi at 10hrs same day (b) one patient for 200mCi at 15hrs same day and (c) one patient for 80mCi at 8hrs the next day. How will you dispense each dose?

(10 marks)

3. Write short notes on the following:

3A. LAL test.

3B. Thermal Neutrons.

3C. Any two short lived generators.

3D. Equivalent dose and effective dose.

(5×4 = 20 marks)

