

MANIPAL UNIVERSITY

SECOND YEAR B.Sc. N.M.T. DEGREE EXAMINATION – JUNE 2013

SUBJECT: FUNDAMENTALS OF ELECTRONICS AND NUCLEAR MEDICINE INSTRUMENTATION

Monday, June 10, 2013

Time: 10:00-13:00 Hrs.

Max. Marks: 80

- ✍ Answer SECTION – A and SECTION – B in two separate answer books.
- ✍ Draw suitable circuit diagram, block diagram, waveform or characteristics wherever it is necessary.

SECTION – A : FUNDAMENTALS OF ELECTRONICS : 30 MARKS

- ✍ Answer any SIX questions of the following:

- 1A. Write a short note on U.P.S.
1B. Explain half-wave rectifier. (2+3 = 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 ADC and DAC.
3B. Write a short note on Pulse shaping. (2+3 = 5 marks)
- 4A. Explain NAND gate.
4B. Explain the working of PMT. (2+3 = 5 marks)
- 5A. Write a short note on acceptor and donor in semiconductor.
5B. Explain pre- amplifier. (2+3 = 5 marks)
6. Explain inverting and non-inverting Op-Amp. (5 marks)
- 7A. Short note on Filter.
7B. Convert 23, 0.75 into binary. Add $(10111)_2 + (11111)_2$ (2+3 = 5 marks)

SECTION – B: NUCLEAR MEDICINE INSTRUMENTATION: 50 MARKS

✍ **Answer all questions.**

8. What are collimators? Explain on the various types of collimators.

(15 marks)

9. To ensure the best performance what are the various tests you should perform on a dose calibrator? Write in detail about any two tests.

(15 marks)

10. **Write short note on the following:**

10A. Single channel analyzer

10B. Scintillation crystal

10C. Scalping effect

10D. H-D curve

(5×4 = 20 marks)



MANIPAL UNIVERSITY
SECOND YEAR B.Sc. N.M.T. DEGREE EXAMINATION – JUNE 2013
SUBJECT: RADIATION CHEMISTRY AND RADIATION PHYSICS

Wednesday, June 12, 2013

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

✍ **Answer ALL the questions.**

1. **Write notes on following:**

- 1A. Acidic and alkaline buffer solution
- 1B. Limitation of Bohr’s atomic theory
- 1C. Types of chemical reactions
- 1D. Atomic weight and equivalent weight

(5×4 = 20 marks)

2. Describe different type of chemical bond formation with examples.

(10 marks)

SECTION – B : RADIATION PHYSICS : 50 MARKS

✍ **Answer all the questions. All questions carry TEN marks.**

3. **Write short note on:**

- 3A. Transient Equilibrium
- 3B. Bohr’s atomic model

4A. Write about Medical Cyclotron mentioning its different components.

4B. Name five Cyclotron produced isotopes with their half-lives and energy.

5. What are the different mechanisms of interactions of gamma radiation with matter?

6A. Explain the different peaks in the Standard Energy Spectrum of ^{137}Cs .

6B. Draw the Energy Spectrums for any five isotopes used in Nuclear Medicine.

7A. What is physical, biological, effective half-life and mean life? How they are related?

7B. Half-life of a radioactive element is 110 mins. Biological half-life is 24 hours. What is the effective half-life, mean half-life of the radionuclide?



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MANIPAL UNIVERSITY
SECOND YEAR B.Sc. N.M.T. DEGREE EXAMINATION – JUNE 2013
SUBJECT: RADIOPHARMACY – I

Friday, June 14, 2013

Time: 10:00-11:30 Hrs.

Max. Marks: 40

✍ **Answer ALL questions.**

1. **Write in short about the following:**

- 1A. Ideal characteristics of therapeutic radiotracers
- 1B. Methods of sterilization of Sodium Pertechnetate
- 1C. Radiation safety measures in radio pharmacy lab
- 1D. Versatile Chemistry of ^{99m}Tc radioisotope

(5×4 = 20 marks)

2. Write about the various constituents present in the cold kit with reference to ^{99m}Tc -Rps. Briefly explain the biological quality control procedures to be adopted during manufacturing of the cold kits. Support your answer with a suitable example.

(4+6 = 10 marks)

3. What is the radioactive successive decay? Describe working principle of different types of ^{99m}Tc -radionuclide generators with the help of diagram. Why solvent extraction generator is not popular now a days?

(2+6+2 = 10 marks)

