Question Paper

Exam Date & Time: 18-Jun-2024 (10:00 AM - 01:00 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

THIRD SEMESTER B.Sc.NUCLEAR MEDICINE TECHNOLOGY DEGREE EXAMINATION-JUNE 2024
SUBJECT: NMT2101- INTRODUCTION TO RADIOPHARMACY
(2020 SCHEME)

Marks: 100 **Duration: 180 mins.**

Answer all the questions.

1)	Describe the design and working principle of different type of radionuclide generators and compare their advantages and disadvantages	(20)
2)	Draw the layout plan for hospital radio-pharmacy. What are the key considerations for designing the ideal layout plan?	(20)
3)	What are the ideal properties of therapeutic radio-nuclides?	(10)
4)	Describe different categories of radiation handling operations carried out in hospital radio-pharmacy	(10)
5A)	What is the need for freeze drying of cold kit components? What is the role of stannous chloride in labelling process?	(5)
5B)	Differentiate between properties of 1st generation and currently used radiopharmaceuticals	(5)
5C)	What is a monograph and what detail does it provide about a radiopharmaceutical?	(5)
5D)	Describe disposal methods for waste generated in a hospital radio-pharmacy	(5)
5E)	Describe direct radio-labelling method with Tc-99m.	(5)
5F)	What is the uptake mechanism for 99mTc-MAA, 99mTc-MDP in lung and skeletal tissue respectively?	(5)
6A)	What is the oxidation state of Tc-99m in pertechnetate?	(2)
6B)	What is reduced hydrolysed colloid?	(2)
6C)	Name a radionuclide impurities in 99mTc-pertechnetate -eluate and its detection method	(2)
6D)	What is the use of a laminar airflow in a radio-pharmacy lab?	(2)
6E)	Which disposal method will be applied for C-14 contaminated solid waste?	(2)

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Question Paper

Exam Date & Time: 20-Jun-2024 (10:00 AM - 01:00 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

THIRD SEMESTER B.Sc. NUCLEAR MEDICINE TECHNOLOGY DEGREE EXAMINATION-JUNE 2024
SUBJECT: NMT2103- MATHEMATICS IN NUCLEAR MEDICINE
(SCHEME 2020)

Marks: 100 **Duration: 180 mins.**

Answer all the questions.

1A) Explain the classification of radiotracer kinetics and its application in nuclear medicine. (10)

1B) i) Differentiate $y = (tanx)^{sinx} + (secx)^{cosx}$ (10)

ii) Evaluate $\lim_{x \to -0} \frac{\sqrt{(1-x)}-1}{x}$

(5+5 = 10 marks)

2A) Integrate the given function using integration by substitution: (10)

$\int 2x \sin(x^2 + 1)$ with respect to x:

2B) Analyze the closed and open compartment using equations and apply it to nuclear medicine. (10)

3A) Find the $\frac{dy}{dx}$ of parametric function $x = \log sec\theta$, $y = tan^2\theta$ (5)

3B) Calculate the exposure level at 30 cm from 215 mCi of I-131 kept in a lead pot having thickness of 9.0 cm (HVT = 0.3 cm) (5)

4) Derive and analyse single compartment using equations and write the application of it in nuclear medicine. (10)

5A) Find the general solution of the differential equation (5)

$$\frac{dy}{dx} = \frac{1+y^2}{1+x^2}$$

5B) Evaluate $\lim_{x \to -5} \frac{3x^2+22x+35}{2x^2+9x-5}$ (5)

5C) Find the value of $\frac{Cos\ 160^0 - Sin135^0}{Cos\ 420^0 + Sin\ 370^0}$ (5)

5D) Find the maxima and minima of the function $x^5 - 15x^3 + 53x + 5.$ (5)

5E) Differentiate the following functions with respect to x: $Sin(3x + 5)^2$ (5)

5F) 496 mCi of 99m-Tc was calibrated on Wednesday 10 am, two scans were taken on the same day with 20 mCi dose each. On Saturday 11 a.m. how much activity would be available. ($t_{1/2}$ = 6 hours) (5)

6A)	Convert 30° *and* 60° into radian.	(2)
6B)	Find successive derivative of $y = 6x^4 + 3x^2 + 2x + 5$	(2)
6C)	Find the effective half-life of an isotope having a biological half-life of 24 hours and physical half-life of 10 hours.	(2)
6D)	Draw the graph of trigonometric function sin x.	(2)
6E)	Convert 83 mCi into MBq.	(2)

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