MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

II SEMESTER M.TECH (INDUSTRIAL BIOTECHNOLOGY)

END-SEMESTER EXAMINATION, 09/05/24 (09:30-12:00PM)

SUBJECT: Pharmaceutical Biotechnology (BIO 5408)

REVISED CREDIT SYSTEM

ANSWER ALL QUESTIONS

TIME: 3 HOURS **MAX. MARKS: 50**

Q. NO		MARKS
1A	What are the uses of pharmacokinetic models?	3
1B	List out the advantages & disadvantages of Buccal & Sublingual and Intravenous routes of administration	4
1C	What are the different theories available to explain the structure of cell membrane and explain it briefly?	3
2A	An antibiotic is given by IV bolus injection at a dose of 500 mg. The apparent volume of distribution was 21 L and the elimination half-life was 6 hours. Urine was collected for 48 hours, and 400 mg of unchanged drug was recovered. What is the fraction of the dose excreted unchanged in the urine? Calculate k_e, Cl_T and Cl	3
2B	If drug is eliminated by first order, what % drug eliminated after 2 half lifes of a drug.	3
2C	A new antibiotic drug was given in a single intravenous bolus of 4 mg/kg to five healthy male adults ranging in age from 23 to 38 years (average weight 70 kg). The pharmacokinetics of the plasma drug concentration–time curve for this drug fits a one-compartment model. The equation of the curve that best fits the data is $Cp=70e^{(-0.36t)}$ Determine the following (assume units of µg/mL for C p and hr for t): a. What is the V_D? b. How much drug is left in the body after 4 hours? c. Predict what body water compartment this drug might occupy and explain why you made this prediction. d. Assuming the drug is no longer effective when levels decline to less than 2 µg/mL, when should you administer the next dose?	4

<table>
<tr><td>3A</td><td>Plasma samples from a patient were collected after an oral bolus dose of 10 mg of a new benzodiazepine solution as follows:

<table><tr><td>Time (hr)</td><td>0.25</td><td>0.5</td><td>0.75</td><td>1</td><td>2</td><td>4</td><td>6</td><td>10</td><td>14</td><td>20</td></tr><tr><td>Concentration (ng/mL)</td><td>2.85</td><td>5.43</td><td>7.75</td><td>9.84</td><td>16.20</td><td>22.15</td><td>23.01</td><td>19.09</td><td>13.90</td><td>7.97</td></tr></table>
From the data above, determine the elimination constant (K) and absorption constant (K_a) of the drug using method of residuals.</td><td>3</td></tr>
<tr><td>3B</td><td>Derive the mathematical expression of D^{∞}_{max} and D^{∞}_{min} at steady state when the drug is administrated by multiple IV injections.</td><td>3</td></tr>
<tr><td>3C</td><td>What is prodrug? why prodrugs are used in formulation? Illustrate different way of making prodrugs</td><td>4</td></tr>
<tr><td>4A</td><td>What is the drawback in conventional cancer therapy and how nano-medicine helps to overcome these barriers?</td><td>4</td></tr>
<tr><td>4B</td><td>Explain nanosyatems in pharmaceutical formulations</td><td>3</td></tr>
<tr><td>4C</td><td>Explain different active targeting moiety used in nanomedicine and limitations of active targeting</td><td>3</td></tr>
<tr><td>5A</td><td>Illustrate how nanosyatems are useful in treating drug resistance infectious diseases with proper reasoning and explanation</td><td>4</td></tr>
<tr><td>5B</td><td>Why delivering drug to posterior part of the eye is very difficult? explain with an example how polymer drug delivery helps in delivering drugs?</td><td>3</td></tr>
<tr><td>5C</td><td>Why tuberculosis is a very difficult disease to contain? explain how Nano-medicine is very promising method for drug delivery?</td><td>3</td></tr>
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