Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

II SEMESTER M.TECH. (INDUSTRIAL BIOTECHNOLOGY)

END SEMESTER EXAMINATIONS, April/May 2018

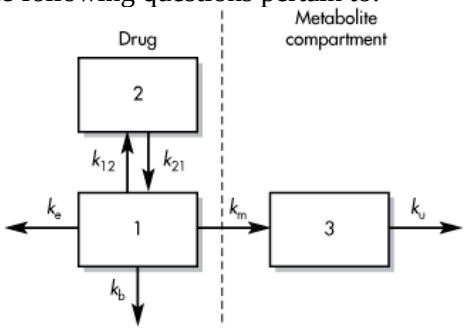
SUBJECT: Biopharmaceuticals & Pharmaceutical Biotechnology [BIO 5245]

REVISED CREDIT SYSTEM

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitable assumed.

1A.	What are the uses of pharmacokinetic models?	**3**
1B.	List out the advantages & disadvantages of the Intravenous route of administration of drug	**3**
1C.	Discuss briefly the mechanism of transport of particles across the cell membrane for the following processes. (a) Facilitated Transport (b) Vesicular transport	**4**
2A.	The pharmacokinetic model presented in represents a drug that is eliminated by renal excretion, biliary excretion, and drug metabolism. The metabolite distribution is described by a one-compartment open model. The following questions pertain to.  (a) How many parameters are needed to describe the model if the drug is injected intravenously (ie, the rate of drug absorption may be neglected)? (b) Which compartment(s) can be sampled? (c) What would be the overall elimination rate constant for elimination of drug from compartment 1? (d) Write an expression describing the rate of change of drug concentration in compartment 1 (dC_1/dt).	**4**
2B.	Exactly 300 mg of a drug are dissolved into an unknown volume of distilled water. After complete dissolution of the drug, 1.0-mL samples were removed and assayed for the drug. The following results were obtained: Time(hr) 0.5 2 Concentration (mg/ml) 0.45 0.3 Assuming zero-order decomposition of the drug, what was the original volume of water in which the drug was dissolved?	**2**

<table>
<tr><td>2C.</td><td>A rather intoxicated young man (75 kg, age 21) was admitted to a rehabilitation center. His blood alcohol content was found to be 210 mg/L. Assuming the average elimination rate of alcohol is 10 mL of ethanol per hour, how long would it take for his blood alcohol concentration to decline to less than the legal blood alcohol concentration of 100 mg/L (Hint: Alcohol is eliminated by zero-order kinetics.) The specific gravity of alcohol is 0.8. The apparent volume of distribution for alcohol is 60% of body weight</td><td>4</td></tr>
<tr><td>3A.</td><td>Develop the mathematical expressions to determine the drug concentration in plasma when the drug is given through IV infusion. Assume drug is eliminated by first order processes and follows one compartment model.</td><td>3</td></tr>
<tr><td>3B.</td><td>A 50-kg woman was given a single IV dose of an antibacterial drug at a dose level of 6 mg/kg. Blood samples were taken at various time intervals. The concentration of the drug (C_p) was determined in the plasma fraction of each blood sample and the following data were obtained:
<table>
<tr><td>Time (h)</td><td>0.25</td><td>0.5</td><td>1</td><td>3</td><td>6</td><td>12</td><td>18</td></tr>
<tr><td>C_P(µg/mL)</td><td>8.21</td><td>7.87</td><td>7.23</td><td>5.15</td><td>3.09</td><td>1.11</td><td>0.40</td></tr>
</table>
(a) What are the values for V_D, k, and $t_{1/2}$ for this drug?
(b) This antibacterial agent is not effective at a plasma concentration of less than 2 µg/mL. What is the duration of activity for this drug?
(c) How long would it take for 90% of this drug to be eliminated?</td><td>3</td></tr>
<tr><td>3C.</td><td>Why are both rapidity and completeness of drug absorption important? What is their significance in drug therapy?</td><td>2</td></tr>
<tr><td>3D.</td><td>How are ionic/ ionizable drugs absorbed?</td><td>2</td></tr>
<tr><td>4A.</td><td>A cephalosporin (k = 0.2 hr^{-1}, V_D = 10 L) was administered by IV multiple dosing; 100 mg was injected every 6 hours for 6 doses. What was the plasma drug concentration 4 hours after the 6th dose, if
(a) the 6th dose was omitted,
(b) the 5th dose were given an hour late
(c) the steady-state plasma drug concentration C^{∞}_p at 3 hours after the last dose</td><td>3</td></tr>
<tr><td>4B.</td><td>Explain briefly about the effect of k_a and k on C_{max}, t_{max}, and AUC</td><td>3</td></tr>
<tr><td>4C.</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:
a. Determine the elimination constant of the drug.
b. Determine k_a by feathering.</td><td>4</td></tr>
<tr><td>5A.</td><td>Define bulk eroding and surface eroding polymer with example and explain their degradation profile and drug releasing profile.</td><td>5</td></tr>
<tr><td>5B.</td><td>How nanoparticles used for drug delivery in cancer therapy is more effective compared to free drug, explain.</td><td>5</td></tr>
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