Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

II SEMESTER M.TECH. EXTERNAL EXAMINATIONS APRIL 2019

SUBJECT: BIOPHARMACEUTICALS AND PHARMACEUTICAL BIOTECHNOLOGY [BIO 5245]

Date of Exam: **29/04/2019** Time of Exam: **9.00 AM – 12.00 AM** Max. Marks: **50**

Instructions to Candidates:

- Answer ALL the questions & missing data may be suitable assumed

1A.	What is the significance of the plasma level–time curve? How does the curve relate to the pharmacologic activity of a drug?	4
1B.	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.	3
1C	A pharmacist dissolved a few milligrams of a new antibiotic drug into exactly 100 mL of distilled water and placed the solution in a refrigerator (5°C). At various time intervals, the pharmacist removed a 10-mL aliquot from the solution and measured the amount of drug contained in each aliquot. The following data were obtained. Time(hr): 0.5, 1, 2, 4, 6, 8, 12 Antibiotic (µg/mL): 84.5, 81.2, 74.5, 61, 48, 35, 8.7 a. What is the rate of decomposition of this antibiotic? b. How many milligrams of antibiotics were in the original solution prepared by the pharmacist? c. Give the equation for the line that best fits the experimental data.	3
2A.	Develop the mathematical expression of derivative method and sigma minus method to calculate k from urinary excretion data when the drug is given by IV bolus administration.	8
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
3A.	Briefly explain the lipid bilayer theory and fluid mosaic model for transport of molecules across cell membrane.	3

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<tr><td>3B.</td><td>A drug with an elimination half-life of 1 hour was given to a male patient (80 kg) by intravenous infusion at a rate of 300 mg/hr. At 7 hours after infusion, the plasma drug concentration was 11 µg/mL.
a. What is the total body clearance for this drug?
b. What is the apparent V_D for this drug?
c. If the drug is not metabolized and is eliminated only by renal excretion, what is the renal clearance of this drug?</td><td>3</td></tr>
<tr><td>3C.</td><td>Studied the pharmacokinetics of amrinone after a single IV bolus injection (75 mg) in 14 healthy adult male volunteers. The pharmacokinetics of this drug followed a two-compartment open model and fit the following equation: $C_p = 4.62e^{(-8.94t)} + 0.64e^{(-0.19t)}$
From these data, calculate:
a. The volume of the central compartment
b. The volume of the tissue compartment
c. The steady state volume of distribution
d. The extrapolated volume of distribution</td><td>4</td></tr>
<tr><td>4A.</td><td>An adult male patient (46 years old, 81 kg) was given orally 250 mg of tetracycline hydrochloride every 8 hours for 2 weeks. From the literature, tetracycline hydrochloride is about 75% bioavailable and has an apparent volume of distribution of 1.5 L/kg. The elimination half-life is about 10 hours. The absorption rate constant is 0.9 hr^{-1}. From this information, calculate C_{max} after the second dose</td><td>3</td></tr>
<tr><td>4B.</td><td>A cephalosporin (k = 0.22 hr^{-1}, V_D = 9 L) was administered by IV multiple dosing; 110 mg was injected every 6 hours for 6 doses. What was the plasma drug concentration 4 hours after the 6th dose, if the 5th dose were given an hour early</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>13.9</td><td>7.97</td></tr>
</table>
From the data above, Determine the elimination constant and k_a of the drug.</td><td>4</td></tr>
<tr><td>5A.</td><td>What are the main reasons for drug recall from the market</td><td>2</td></tr>
<tr><td>5B.</td><td>Briefly explain the role of quality assurance and quality control department in the pharma industry.</td><td>3</td></tr>
<tr><td>5C.</td><td>Discuss briefly glomerular filtration and urine formation in kidney</td><td>3</td></tr>
<tr><td>5D.</td><td>A 100 mg/hr infusion is given for 2 hours and two samples are collected at 2 hr and 8 hr after the infusion was stopped. These values were 7.6 mg/L and 2.4 mg/L. What is the value of k in this patient?</td><td>2</td></tr>
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