MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
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II SEMESTER M.TECH (INDUSTRIAL BIOTECHNOLOGY)
END-SEMESTER EXAMINATION, 27/06/22 (02:00-05:00PM)
SUBJECT: Pharmaceutical Biotechnology (BIO 5009)
REVISED CREDIT SYSTEM
ANSWER ALL QUESTIONS

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

<table>
<tr><th>Q. NO</th><th></th><th>MARKS</th></tr>
<tr><td>1A</td><td>Briefly explain the significance of the plasma level–time curve? How does the curve relate to the pharmacologic activity of a drug?</td><td>4</td></tr>
<tr><td>1B</td><td>What are the merits and demerits of oral route of administration?</td><td>3</td></tr>
<tr><td>1C</td><td>Calculate the half-life for Methotrexate in a patient weighing 70 kg, the volume of distribution of the drug is 0.4 L/kg and the renal clearance is 3 L/hr, assuming 95% of the drug is eliminated in the urine unchanged (unmetabolized).</td><td>3</td></tr>
<tr><td>2A</td><td>Briefly explain the vesicular and pore transport of drugs in the body.</td><td>3</td></tr>
<tr><td>2B</td><td>A single IV dose of an antibiotic was given to a 50-kg woman at a dose level of 20 mg/kg. Urine samples were removed periodically and assayed for parent drug. The following data were obtained:
<table>
<tr><td>Time (hr)</td><td>0.25</td><td>0.5</td><td>1</td><td>2</td><td>4</td><td>6</td></tr>
<tr><td>D_u (mg)</td><td>160</td><td>140</td><td>200</td><td>250</td><td>188</td><td>46</td></tr>
</table>
Calculate all elimination rate constants of drug using rate method</td><td>3</td></tr>
<tr><td>2C</td><td>Derive the Wagner–Nelson Method to calculate absorption rate constant when the drug is given orally (Assume drug is eliminating by first order and follows one compartment model)</td><td>4</td></tr>
<tr><td>3A</td><td>A patient receives 1000 mg every 6 hours by repetitive IV injection of an antibiotic with an elimination half-life of 3 hours. Assume the drug is distributed according to a one-compartment model and the volume of distribution is 20 L.
a) Determine the maximum plasma concentration of the drug at steady state.
b) the plasma drug concentration C_p at 3 hours after the second dose
c) Average plasma concentration of drug.</td><td>3</td></tr>
<tr><td>3B</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</td><td>3</td></tr>
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	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 a) plasma drug concentration C_p at 4 hours after the 7th dose, b) Maximum and Minimum Concentration at steady state	
3C	Why oral insulin delivery is always a challenging research topic and explain recent developments in the area	**4**
4A	What is prodrug? why prodrugs are used in formulation?	**3**
4B	How dopamine is delivered to brain?	**2**
4C	Nanomaterials are used to deliver drug to tumor. How it is useful compared to pure drug?	**3**
4D	What are hydrogels? How they are useful for drug delivery?	**2**
5A	Difference between polyclonal and monoclonal antibodies? How antibodies are used for tumour targeted drug delivery?	**3**
5B	Why delivering drug to posterior part of the eye is very difficult? explain with an example how polymer drug delivery helps in delivering drugs?	**3**
5C	Why tuberculosis is a very difficult disease to contain? explain how Nano-medicine is very promising method for drug delivery?	**4**