Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

VI SEMESTER B.Tech (BME) DEGREE END SEM EXAMINATIONS APRIL/MAY 2017
SUBJECT: DRUG DELIVERY (BME 4004)
(REVISED CREDIT SYSTEM)

Saturday, 29th April 2017: 2 PM to 5 PM

TIME: 3 HOURS **MAX. MARKS: 100**

Instructions to Candidates:

Answer all the five full questions.

1A. Explain in detail the different classes of 'acquired immunity'. Compare 'exotoxin' and 'endotoxin'. **4+2**

1B. Compare the methods of preparation of small pox vaccine. **10**

1C. Why are toxin antitoxin floccules (T.A.F) suitable for adults who are susceptible to alum precipitated toxoid (APT)? **2+2**

After collecting of blood (from toxoid treated horse), how would you proceed to obtain dry product (powder) of diphtheria antitoxin?

2A. Explain graphically the therapeutic range (MTC, MEC, onset of action, duration of action) of a drug. **4**

2B. Explain how 'route of administration' and 'particle size' of the drug can be used to produce sustained action of a drug. **4+4**
Compare the design of matrix and reservoir type of transdermal patches.

2C. 30% of a dose of a drug is destroyed by acid in the stomach, the remaining drug is able to penetrate the apical membrane completely, and 40% of the drug entering the liver is metabolized. If the effective dose of the drug is 20, then calculate the amount of drug required to be administered. **3+5**

Explain graphically, how you would determine the 'therapeutic range' of a drug.

3A. Pindolol has a volume of distribution (Vd) of 2300L. If the plasma concentration is 1mg/L, **6**
(i) How much of drug is in the body?
(ii) How much of drug is in the plasma?(assume that the volume of plasma is 3L)
(iii)How much of drug is in the tissue?

3B. Lipoamide is an antipyretic drug, noslatol is a β1-adrenergic antagonist, and disolvprazole is a proton pump inhibitor. The physiochemical characteristics of the three drugs is listed in the table **8**

	Lipoamide	Noslatol	Disolvprazole
Acid or Base	base	acid	base
Molecular mass	396 Da	365 Da	221 Da
Log P	3.2	2.1	0.2
Log $D_{6.0}$	3.0	1.8	-2.8
Solubility pH1-7.5	High1g/1000mL	Low 0.5g/1000mL	High 5g/1000 mL
Main enzyme involved in metabolism	CYP3A4	CYP3A4	none
Substrate for intestinal uptake transporter	none	none	OATP1
Substrate for intestinal efflux transporter	p-gp	p-gp	none
Bioavailability factor	0.21	0.7	0.5

Use this information to discuss potential of the stated drugs for oral administration. Address in detail about how the information provides insight into how they may penetrate the intestinal membrane, and their expected extent of absorption.
Discuss how you would predict 'food' to affect their absorption.
Suggest possible explanations for the value of bioavailability reported for each drug.

3C. Analyze and predict the feasibility of the type of passive diffusion possible for each drug based on the following data: **3+3**

Drug	Log P	Log $D_{6.0}$
Atenolol	0.10	-2.74
Famotidine	-0.40	-2.06
Ibuprofen	3.72	2.12

Highlight the different types of efflux transporter. Explain how an uptake transporter plays the role of efflux transporter in a carrier mediated drug distribution process.

4A. Explain graphically, the influence of tissue and plasma protein binding on the pattern of drug distribution. **4**

4B. The values of the volume of distribution of three drugs (A,B,C) are given below **4**
Drug A: 35L in a 70kg person
Drug B: 10L in 70 kg person.
Drug C: 1000L in a 70 kg person.

Address specifically the potential volume into which the drugs distribute, and the binding to the tissues and the plasma protein.

4C. Explain the role of the following in hepatic metabolism: **12**

(i) Phase-I and Phase-II process, (ii) Cytochrome system, (iii) drug-drug interaction and (iv) hepatic drug transporter.

5A. The value of the Hepatic extraction of a drug is 0.4. What would be the hepatic bioavailability of the drug? **2+6**

How would you restrict the tubular reabsorption of the drug to enhance renal clearance in the following cases:
(i) Acidic and basic drugs, (ii) less urine flow.
Explain your views.

5B. A drug Ofloxacin, which is 40% bound to proteins, has a renal clearance of 300 mL/min. what are the relative values of active secretion and tubular resorption? **4**

5C. Establish relationship among clearance, volume of distribution, elimination rate constant and elimination half-life. **8**