

Max marks 80

Time 3 hours

Note : All questions are compulsory

- Q 1.** Answer the following (all questions carry equal marks): **20**
- A.** Give the applications of pharmacokinetic modelling.
 - B.** Explain why an increase in infusion rate does not shorten the time to reach steady state drug concentration.
 - C.** If $K < K_a$, then the terminal slope of the plasma concentration reflects absorption not elimination. True or False? Justify.
 - D.** Outline the tests to detect non-linearity in pharmacokinetics.
 - E.** Differentiate between equilibrating and concentrating transporters.
 - F.** The loading dose significantly affects the steady state concentration of a drug given by multiple doses. True or False? Justify.
 - G.** State the advantages of Latin Square cross-over design for conducting a comparative bioavailability study.
 - H.** Define 'dose-dependent' and 'time –dependent' pharmacokinetics.
 - I.** Give the merits of Wagner Nelson method over method of residuals for determination of absorption rate constant.
 - J.** What is 'fluctuation ratio' during a multiple dose IV bolus dosing?
- Q 2.**
- a.** After an IV bolus dose of 400mg of a drug to a 65kg patient, the zero-time concentration was 20mg/L and elimination rate was 0.09 hr^{-1} . Calculate half-life, volume of distribution, total clearance and AUC (zero to infinity) for this drug. **4**
 - b.** Derive equations to determine the maximum, minimum and average plasma concentrations at steady state following multiple oral dosing. **4**
 - c.** Discuss non-linear pharmacokinetics due to drug-protein binding. **4**
- Q3.**
- a.** How is the elimination rate constant estimated from urinary excretion data by the ARE method? **4**
 - b.** A patient receives 100mg of a drug every eight hours by multiple IV injections. The drug has a volume of distribution of 27 litres and elimination half-life of 4 hours. Calculate the maximum, minimum and average steady-state plasma concentrations of the drug. What will be the plasma concentration 5 hours after the third dose? **4**
 - c.** Explain how transporters are involved in the systemic absorption and elimination of drugs with examples. **4**

- Q4. a.** Derive equations to estimate the maximum and minimum plasma concentrations (after plateau has reached) of the nth dosing interval. **4**
- b.** A drug following one compartment kinetics has a half-life of 5.3 hours and a volume of distribution of 27 L. Calculate the following: **4**
- (i) What should be the infusion rate to reach a steady state plasma concentration of 15mg/ml?
- (ii) At what time will 95% of C_{ss} be reached?
- (iii) What should be the loading dose?
- (iv) What is the total body clearance?
- c.** What are pharmacokinetic parameters? Classify them. Define any two such parameters. **4**
- Q5. a.** Write a note on ‘types of compartmental models’. **4**
- b.** Describe the method of residuals for determination of absorption rate constant following oral absorption. **4**
- c.** A single oral dose of 500mg of azithromycin ($F=0.8$) was given to a 80 kg patient. The plasma concentration-time profile can be described by: **4**
- $$C_p = 1.32 (e^{-0.15t} - e^{-1.62t})$$
- where, $C_p = \text{mg/L}$, $t = \text{hours}$
- Assuming no flip kinetics occurs, calculate any four pharmacokinetic parameters for azithromycin. On the semi-log graph paper, plot the calculated concentrations at any eight time points of your choice.
- Q6. a.** The same drug in different formulations was administered to the same volunteers and following data was obtained: **4**
- IV bolus administration of 25mg : $AUC = 10\text{mg.hr/L}$
- Oral administration 40mg suspension : $AUC = 20\text{mg.hr/L}$
- Oral administration 100mg dispersible tablet : $AUC = 22\text{mg.hr/L}$
- Calculate
- (i) absolute bioavailability of drug from suspension
- (ii) absolute bioavailability of drug from tablet
- (iii) relative bioavailability of suspension to tablet
- Are the oral formulations bioequivalent?
- b.** Give the design of dosage regimen from plasma concentrations with appropriate equations. **4**
- c.** Explain the methods of assessment of bioavailability by indirect methods. **4**