ASTU M.Ph
1st Sem.

2/12/13 (Reg)

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Roll No. of candidate | | | | | | | | | | |

2013

(Odd Semester)

BIOPHARMACEUTICS AND PHARMACOKINETICS

Full Marks–100 Pass Marks–35 Time–Three hours

The figures in the margin indicate full marks for the questions.

Answer 8 (Eight) questions taking 4(four) from each section. Question Nos. 1 and 6 are compulsory.

SECTION –A

1. Answer the following questions :

(a) The parameters which represents the extent of absorption of a drug from its dosage form is 1

(i) t_{max}

(ii) C_{max}

(iii) AUC

(iv) MEC

[Turn over

(b) The plasma drug concentration between the limits of therapeutically effective level and toxic level is called 1

(c) What are the three parameters by which elimination phase of a drug can be characterized ? 1

(d) Give the equation for extraction ratio used in determination of organ clearance of a drug. 1

(e) When the systemic availability of a drug administered orally is determined in comparison to its intravenous administration it is called — 1

(i) Systemic bioavailability

(ii) Absolute bioavailability

(iii) Relative bioavailability

(iv) Bioavailability

(f) Absorption rate constant can be calculated by the method of 1

(g) Michealis-Menten equation describes 1

(i) Absorption process

(ii) ADME process

(iii) Kinetics of saturable process

(iv) Dyanamics of capacity limited process

(h) The volume of distribution of a drug is

(i) an expression of total body volume

(ii) a measure of total fluid volume

(iii) a relationship between the total amount of the drug in the body and the concentration of the drug in the blood

(iv) proportional to bioavailability of the drug. 1

(i) Name two indirect methods which are used to measure the bioavailability of a drug. 1

(j) Define solid solution. 1

(k) When two identical dosage forms reach the systemic circulation at the same rate and extent, it is called — 1

(i) Pharmaceutic equivalence

(ii) Chemical equivalence

(iii) Systemic equivalence

(iv) Bioequivalence

(l) What is the sink condition ? 1

(m) Match the following regions in GIT with the pH level indicated from A to E

(1) Mouth (2) Stomach

(3) Duodenum (4) Large intestine

(i) 5.0 – 6.0

(ii) 6.8 – 7.5

(iii) 6.8 – 7.0

(iv) 3.0 – 5.0

(v) 1.5 – 3.0 1

(n) Mathematical model that relates pharmacologic effect to a measured concentration of drug in plasma is called 1

2. (a) Name and define three pharmacokinetic parameters that describe a typical plasma level-time curve 4

(b) What assumptions are made in the development of compartmental models ? What are the advantages and disadvantages of such modeling approach ? 4+4=8

3. (a) Define clearance. What are total body clearance and organ clearance ? 4

(b) Prove mathematically that when an i.v. loading dose is followed immediately by a constant rate infusion, the plasma concentration remain steady as long as the infusion is continued. 8

4. What is flip-flop phenomenon and when is it observed ? Explain how the method of residuals is used to determine the absorption rate constant for a drug that follows one-compartment model kinetics and extra-vascular administration. Name one method which is alternative to the method of residuals used in the estimation of K_a. 3+8+1=12

5. (a) Define apparent volume of distribution. Discuss its importance in delivery of a dosage regimen. 4

(b) Write the significance of protein binding and drug action. 4

(c) What are the limitations of calculating K_m and V_{max} estimated by a single capacity-limited process ? 4

SECTION–B

6. Answer the following questions.

(a) Give two causes of non-linearity in drug absorption process. 1

(b) Define dosage regimen. 1

(c) There are some statements related to the protein binding of drugs as given below—

(P) Protein binding decreases the free drug concentration in the system

(Q) Protein binding to plasma albumin is an irreversible process

(R) Drug with a low lipophilicity have a high degree of protein binding

(S) Protein binding of one drug can be affected by the presence of other drugs.

Choose the correct combination of statements—

(1) P & Q are true while R & S are false

(2) Q & R are true while P & S are false

(3) R & S are true while P & Q are false

(4) P & S are true while Q & R are false

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(d) The biologic half-life of a drug (1st order process) is represented by— 1

(i) 1/K

(ii) 2.303/logK

(iii) 0.693/K

(iv) 0.693/logK

(e) What are the primary Pharmacokinetic parameters ? 1

(f) According to pH partition theory, a weakly acidic drug will most likely be absorbed from the stomach because the drug exist primarily in the —

(i) un-ionized, more lipid soluble form

(ii) ionized, more water soluble form

(iii) form of weak acid and more soluble in acidic media

(iv) ionic form of the drug which facilitates diffusion 1

(g) The area under serum concentration curve of a drug represents — 1

(i) the biologic half-life of the drug

(ii) the amount of drug in the original dosage form

(iii) the amount of drug absorbed

(iv) the amount of drug excreted in the urine

(h) *In-vitro* dissolution rate studies on drug product are useful in bioavailability evaluation if they are correlated with 1

(i) disintegration time

(ii) *in-vivo* studies in at least three species of animals

(iii) the chemical stability of the drug

(iv) *in-vivo* studies in human.

(i) Creatinine clearance is used as a measurement of — 1

(i) Glomerular filtration rate

(ii) Renal excretion rate

(iii) Drug metabolism rate

(iv) Passive renal excretion

(j) Listed below is the percentage of protein binding of some drugs given in (A) to (D). Match them 2

(1) 0%	(A) Oxyphenbutazone
(2) 99%	(B) Linisopril
	(C) Hexabarbitol
	(D) Morphine

(k) The initial distribution of a drug into the tissue is determined chiefly by — 1

(i) rate of blood flow in to the tissue

(ii) plasma protein binding of the drug

(iii) affinity of the drug for the tissue

(iv) stomach emptying time

(l) Non-linear pharmacokinetics can be expected due to —

(P) Enzyme induction (Q) Active secretion

Choose the correct answer-

(i) Both (P) & (Q) are true

(ii) (P) is true, (Q) is false

(iii) (Q) is true, (P) is false

(iv) Both (P) & (Q) are false 1

7. What do you understand by an optimal multiple dosage regimen ? What are the parameters which govern the concentration of drug in the body at any given time. Show how the calculation of minimum plasma drug concentration is done in multiple dosing. What are the factors on which the plasma drug fluctuation depends ? 2+2+6+2=12

8. (a) What is the significance of determination of AUC values ? How is the AUC value determined graphically ? 5

(b) Explain the significance of the parameters used in bioavailability determination by urinary excretion studies. 7

9. (a) What are the objectives and approaches in developing *in vivo - in vitro* correlations ? 4

(b) Show the disposition pathways of drugs in the body with the help of the Physiological Pharmacokinetic models. What are the advantages of Physiological models over Compartmental models ? 5+3=8

10. (a) What factors should be considered in the design of dissolution testing models ? 4

(b) Explain briefly the general experimental design used for Bioequivalence study. What statistical tools would you apply for interpretation of Bioequivalence study data ? 6+2=8