Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/M.PHARM/SEM-1/MPT-116/2011-12

2011

BIOPHARMACEUTICS AND PHARMACOKINETICS

Time Allotted : 3 Hours *Full Marks* : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following : $10 \times 1 = 10$

   i) Two products are deemed to be bioequivalent when ratio of their dose adjusted AUCs (T/R) is

      a) $T/R > 125\%$

      b) $T/R \leq 80\%$

      c) $80\% < T/R < 125\%$

      d) all of these.

   ii) Lineweaver-Burke Plot is also known as

      a) double reciprocal plot

      b) single reciprocal plot

      c) Scatchard plot

      d) direct plot.

iii) The loading dose of a drug is generally based on

a) total body clearance of the drug

b) AUC

c) apparent volume of distribution and the desired drug concentration in plasma

d) per cent of drug bound to plasma proteins.

iv) The drug bound to plasma proteins and tissue component is

a) pharmacokinetically inactive

b) pharmacokinetically active

c) pharmacodynamically inactive

d) pharmacodynamically active.

v) Marker used for the determination of plasma volume is

a) I-131 albumin

b) Evans blue

c) Brilliant green

d) Sunset orange.

vi) The renal clearance of inolin is used as a measure of

a) intrinsic enzyme activity

b) active renal secretion

c) glomerular filtration rate

d) effective renal blood flow.

vii) The pharmacokinetic model closest to human anatomy & physiology is

a) Empirical model

b) Compartment model

c) Non-compartmental model

d) PB/PK model.

viii) The 'flip-flop' phenomenon occurs when

a) $K_a / K_e < 0{\cdot}3$

b) $K_a / K_e > 0{\cdot}3$

c) $0{\cdot}3 < K_a / K_e < 3{\cdot}0$

d) $K_a / K_e > 3{\cdot}0$.

ix) Loc-I-Gut method may be used for absorption studies in

a) humans b) dogs

c) pigs d) all of these.

x) The pharmacokinetic parameter useful for the determination of obsolute and relative bioavailability is

a) AUC b) T_{max}

c) V_d d) Clearance.

xi) Renal clearance ratio of 0 indicates that the drug is

a) filtered only

b) filtered and reabsorbed completely

c) filtered and reabsorbed partially

d) filtered and secreted actively.

xii) A drug has a $t_{1/2}$ of 4 hr. Following an *iv* injection of 100 mg, plasma concentration was 10 μg/ml. If the 100 mg *iv* dose is repeated every 6 hr until a plasma conc. plateau is reached, the C_{max} will be

a) 5·49 μg/ml b) 15·5 μg/ml

c) 20·5 μg/ml d) 10·5 μg/ml.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. What is hepatic clearance ? What are the factors affecting hepatic clearance of a drug ?

3. Discuss the role of animal models in bioavailability studies.

4. Write an account on dose adjustment in renal failure patients.

5. What is volume of distribution ? Why is it called "Apparent" ? Derive an expression between V_{app} and plasma protein binding.

6. Discuss Wagner-Nelson method for determining K_a . Mention the advantages and limitations of the method.

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

7. Define & classify compartments. Mention the advantages & limitations of Classical Compartment Modelling. Derive the disposition equations of a drug following two compartment open model and administered as I.V. bolus injection.

8. Discuss the determination of elimination rate constant from plasma and urinary excretion data. What are the limitations of such method ?

9. a) The equation that best fits the plasma level time curve after I.V. bolus dose of a drug 100 mg is $C = 7{\cdot}14\, e^{-0{\cdot}17^{3}t}$.

Calculate :

i) volume of distribution

ii) elimination $t_{1/2}$

iii) total AUC

iv) total systemic clearance

v) plasma concentration at 20 min after 250 mg I.V. bolus dose.

b) What are dose dependent kinetics and linear kinetics ? Deseribe Michaelis-Menten equation to indicate kinetics of capacity limited process. What are the cases of non-linearity in pharmocokinetic behaviour ?

7 + 2 + 2 + 4

10. Describe various approaches used to enhance B.A. of drugs. What do you mean by IVIVC ? Describe various approaches used to determine IVIVC. 5 + 2 + 8

11. a) A 70 kg patient is to be given oubain by I.V. infusion. The drug has a half-life of 22 hours, apparent V_d is 15·7 lit and the desired steady-state plasma concentration is 0·0002 mcg/ml. Assuming one compartment kinetics, calculate

i) time to reach 90% of C_{ss}

ii) the infusion rote to achieve the desired C_{ss}

iii) the loading dose to attain C_{ss} rapidly.

b) Derive an expression for minimum, maximum & steady state concentrations in plasma following multiple I.V. dosing. 5 + 10