Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.Pharm/SEM-6/PT-611/2010

2010

PHARMACEUTICS (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) Which of the following mechanism is responsible for gastrointestinal absorption of Vitamin B_1 and B_2 ?

      a) Passive diffusion

      b) Active transport

      c) Facilitated diffusion

      d) Pore transport.

   ii) Which form of novobiocin shows better bioavailability ?

      a) Sodium salf form b) Calcium salt form

      c) Potassium salt form d) Free acid form.

iii) After extravascular administration of a drug exhibiting two compartment characteristic, absorption rate constant (K_a) can be determined by

a) Loo-Riegelman method

b) Wagner-Nelson method

c) Michaelis-Menten method

d) Rate constant determination method.

iv) If the pK_a value of an weakly acidic drug is 2·1, then its percentage ionization in stomach (stomach pH = 1·1) is approximately

a) 7·1 b) 6·1

c) 8·1 d) 9·1.

v) The slope of log (% unabsorbed) versus time plot is – 0·3. The first order absorption rate constant (K_a) is

a) 0·6909/hr b) 0·5808/hr

c) 7·0809/hr d) 8·0809/hr.

vi) Which of the following gives a measure of the extent of absorption of a drug from its dosage form ?

a) Cmax b) tmax

c) AUC d) all of these.

vii) Which of the following blood protein is the binding site for steroids ?

a) Human serum albumin

b) Alpha-1-acid glycoprotein

c) Lipoprotein

d) Alpha-1-globulin.

viii) Which of the following methods is not conducive for drugs crossing the BBB ?

a) Use of permeation enhancers

b) Addition of polyoxyethylene groups to the parent drug

c) Osmotic disruption of the BBB using mannitol

d) Using dihydropyridine redox system as drug carriers to the brain.

ix) Facilitated diffusion is a carrier mediated transport system which is characterized by

a) downhill process where energy is not required

b) downhill process where energy is required

c) uphill process where energy is not required

d) uphill process where energy is required.

x) Orally administered Sabin polio vaccine and large protein molecules are throught to be absorbed by

a) phagocytosis b) pinocytosis

c) ion-pair transport d) none of these.

xi) For majority of drugs that bind to extra-vascular tissues, the order of binding is

a) liver > kidney > lung > muscle

b) kidney > liver > musde > lung

c) muscle > lung > kidney > liver

d) lung > liver > kidney > musde.

xii) Which of the following lubricant promotes disintegration as well as dissolution ?

a) Magnesium stearate

b) Purified talc

c) Sodium lauryl sulphate

d) None of these.

GROUP – B

(Short Answer Type Questions)

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

2. Write a short note on Placental barrier.

3. Why is Human Serum Albumin (HSA) considered a versatile protein for drug binding ? With examples, name the various binding sites on HAS.

4. Compare the absorption characteristics of drugs absorbed by zero order with those absorbed by first order process after extra vascular administration.

5. After oral administration of a metoprolol succinate tablet (100 mg), its pharmacokinetic is best fitted by the equation $C = 0{\cdot}5\ (e^{-0{\cdot}2t} - e^{-0{\cdot}4t})$, where '$t$' is in hours and '$C$' is in μg/ml. Assuming one compartment kinetics determine the peak time, peak plasma concentration and AUC. Also calculate the plasma concentration after 2 hour administration of the drug. (Fraction bioavailable = 0·65).

6. Define the term 'method of residual'. Explain how it is applied in the determination of absorption and elimination rate constants.

GROUP – C

(Long Answer Type Questions)

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

7. a) Define the term 'dissolution' and 'dissolution rate'. Discuss the three theories of dissolution and with their mathematical equations. 1 + 1 + 8

   b) What do you mean by sink condition and how is it maintained ? 1 + 1

   c) If a tablet follows Hixson and Crowell's cubic root law of dissolution having original drug content 125 mg. After 5 hour of dissolution amount of drug released was 98 mg, then calculate the dissolution rate constant. 3

8. a) In case of one compartment open model, what does the term 'open' indicate ? Derive an expression for plasma concentration as a function of time after intravenous infusion of a drug following one compartment characteristics. Determine the loading dose and pharmacokinetic parameters including AUC.

   1 + 4 + 1 + 4

   b) A patient is to be given ceftriaxone by i.v. infusion. The plasma concentration obtained after 24 and 48 hours are 0·0008 and 0·00112 μg/ml respectively. If the apparent volume of distribution is 25 litres, then find out the followings :

   i) Elimination rate constant (K_E)

   ii) Steady state concentration (C_{SS})

   iii) Infusion rate (R_0) to achieve the desired steady state

   iv) Loading dose to obtain C_{SS} rapidly. 5

9. a) Define bioavailability. 1

b) What are the objectives of bioavailability study ? 2

c) Write any one of the pharmacokinetic methods for determination of bioavailability. 5

d) Write details about metbod for enhancement of bioavailability. 7

10. a) What is protein binding of drugs ? 2

b) When is drug binding considered irreversible ? What could be the possible consequences of such an interaction ? 2 + 3

c) Describe the different factors affecting protein binding of drugs. 8

11. a) Show that after extravascular administration the C_{max} that can be attained is no more than 37% of maximum level attained with the same dose given as i.v. bolus. 7

b) A patient is given an antibiotic having $t\frac{1}{2}$ of 4 hrs, by constant i.v. infusion at a rate of 3 mg/hr. At the end of 36 hr. the plasma drug concentration is 2·2 mg/L. Calculate the total body clearance, cl_t for this antibiotic. What is the volume of distribution, V_d of the drug ? 8