THE OPEN UNIVERSITY OF SRI LANKA
FACULTY OF HEALTH SCIENCES
DEPARTMENT OF PHARMACY
ACADEMIC YEAR 2018/2019 – SEMSETER I

BACHELOR OF PHARMACY HONOURS
BPU4140- BIOPHARMACEUTICS AND PHARMACOKINETICS
FINAL EXAMINATION
DURATION: TWO HOURS

DATE: 27th FEBRUARY 2019 TIME: 01.30 PM –03.30 PM

INDEX NO: .....

INFORMATION TO CANDIDATES

- This question paper consists of **05 pages** with **04 Structured Essay Questions.**
- **Structured Essay Questions:** Write answers in the provided booklet/ sheets.

IMPORTANT INSTRUCTIONS

- Write your Index Number in the space provided.
- Answer **All** questions.
- Do **NOT** remove any page/part of this question paper from the examination hall.
- Do **NOT** keep unauthorized material, including mobile phones and other electronic equipment, with you during the examination.
- Use non-programmable calculators.

Structured Essay Questions (100 marks)

01.

1.1 A patient was given an IV infusion of drug X. This drug achieves its steady state concentration (10 mg/mL) 10 min after starting the infusion. After 30 min, the infusion pump was removed. Within 20 min the drug was completely eliminated from the body. Draw the graph which represent above mentioned data. (03 marks)

1.2 What are plasma level time curves? (02 marks)

1.3 What is bioavailability? (03 marks)

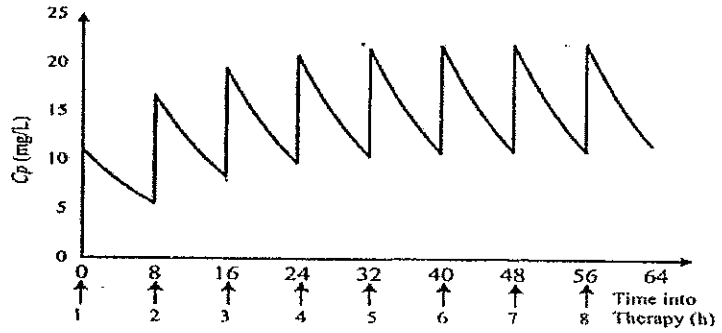
1.4 What is the meaning of drug clearance? (03 marks)

1.5 What is the meaning of bioequivalence? (02 marks)

1.6 Write four (04) advantages of IV infusions. (02 marks)

1.7 Classify compartment model. (08 marks)

1.8 In what type of drug therapy following graph can be observed when time vs plasma drug concentration is plotted? What is the compartment model? (02 marks)



02.

An old female patient was given a 500mg of co-amoxicillin drug as IV bolus. Her blood samples were collected at various time intervals and analyzed for plasma drug concentration and results were tabulated as below.

Time (h)	Concentration (mg/L)
0.5	20.60
1	13.40
2	7.30
3	5.00
4	3.70
6	2.20
8	1.40
10	0.82
12	0.50

2.1 Draw the graph in a semi-log graph paper. (08 marks)

2.2 Based on the graph, how many compartments are there? (02 marks)

2.3 Write the equation which can be used to find plasma drug concentration at any time point in the plotted curve. Do necessary calculations and substitute relevant values in the written the equation. (10 marks)

2.4 Calculate the plasma drug concentration when the time equals 4 hour using the value substituted equation in 2.3 and comment on the result. (05 marks)

03.

3.1 What is the meaning of "Rate of a reaction"? (02 marks)

3.2 Write the salient features of the compartment model. (04 marks)

A 50 kg woman was given a single IV dose of an antibiotic at a dose of 6mg/kg. Blood samples were collected at various time intervals and the plasma drug concentration was determined and following data was obtained.

Time (hours)	C_p (µg/mL)
0.25	8.21
0.5	7.87
1	7.23
3	5.15
6	3.09
12	1.11
18	0.40

3.3 Draw the graph using above data in a suitable graph paper. (06 marks)

3.4 Calculate the elimination rate constant of the antibiotic given. (03 marks)

3.5 Calculate the time taken to reduce the initial drug concentration by half (03 marks)

3.6 Calculate the V_d of the drug (03 marks)

3.7 This antibiotic is not effective if the C_p is less than 2mcg/mL. Therefore what is the duration of action? (04 marks)

04.

4.1 Write five (05) drawbacks of classical compartmental analysis. (05 marks)
4.2 Write the equation for mean residence time and define terms. (04 marks)
4.3 Write advantages and disadvantages of Wagner Nelson method. (04 marks)

4.4 A single dose (200mg) of drug A was given to an adult male patient (body weight= 68 kg). The V_d is 8.7 L. The pharmacokinetics of the drug is explained by the following equation.

$Cp = 47e^{-0.07t}$
t in hours
Cp in μmL^{-}

a. State the pharmacokinetic model for the above drug. (02 marks)

b. What is the elimination rate constant of the drug A? (05 marks)

c. What is the time taken to reduce drug concentration by half of its initial concentration? (05 marks)

Following are useful equations and their terms have usual meanings.

$a+b = k_{12}+k_{21}+k$

$ab = k_{21} * k$

$C_p = A\, e^{-at} + B\, e^{-bt}$

$A = Do\,(a-k_{21}) / \{V_p(a-b)\}$

$B = Do\,(k_{21}-b) / \{V_p(a-b)\}$

$k = ab(A+B) / \{Ab+Ba\}$

$k_{12} = AB(b-a)^2 / \{(A+B)(Ab+Ba)\}$

$k_{21} = (Ab+Ba)/(A+B)$

$C_{pss} = C_{pmax.ss}\, e^{-kt}$

$C_{pmin.ss} = C_{pmax.ss}\, e^{-k\,\tau}$