UNIVERSITY OF THE PUNJAB

Fourth Prof. A/2015
Examination: Doctor of Pharmacy (Pharm.D.)

Roll No. .....

Subject: Pharmaceutics-VII (Biopharmaceutics) **TIME ALLOWED: 3 hrs.**
PAPER: 4 **MAX. MARKS: 100**

NOTE: Attempt any FIVE questions. All Questions carry equal marks.

Q. 1	**a)**	Define the following terminologies: I) Pharmaceutical equivalent II) Population Pharmacokinetics III) Mammillary model IV) Area under the first moment of curve V) Disposition Kinetics	10 Marks
	b)	Briefly describe the various mechanisms of drug absorption.	10 Marks
Q. 2	**a)**	Describe the volume of distribution.	10 Marks
	b)	Discuss the types of proteins involved in drug protein binding. Explain clinical significance of plasma protein binding.	10 Marks
Q. 3	**a)**	What is the difference between Phase I and Phase II reactions? Describe phase II biotransformation reactions with at least one example.	14 Marks
	b)	Discuss the parameters of multiple dose regimens.	6 Marks
Q. 4	**a)**	What are the parameters required for determination of one compartment open model after oral administration?	8 Marks
	b)	Demonstrate with illustration the calculation of distribution rate constant for two compartment IV model.	12 Marks
Q. 5	**a)**	Role of Biopharmaceutics in dosage form design?	15 Marks
	b)	Define bioavailability. Discuss different rate limiting steps in drug absorption.	5 Marks
Q. 6	**a)**	What is the biological half life? Describe the significance and the factors affecting half life.	10 Marks
	b)	Discuss pharmacokinetics of intravenous infusion and calculate half life of a drug after IV infusion.	10 Marks
Q. 7		Explain following terms briefly: I) Trapezoidal method II) Body clearance III) Bioavailability measurement using blood data	5+6+9 Marks

UNIVERSITY OF THE PUNJAB

Fourth Prof. A/2016
Examination: Doctor of Pharmacy (Pharm.D.)

Roll No. .....

Subject: Pharmaceutics-VII (Biopharmaceutics)
PAPER: 4

TIME ALLOWED: 3 hrs.
MAX. MARKS: 100

NOTE: Attempt any FIVE questions. All Questions carry equal marks.

Q1 a) Define the following terms: 5 Marks
i) Absolute bioavailability ii) Bioequivalent products
iii) Closed compartment iv) Steady state concentration
v) Pharmaceutical equivalents

b) Discuss the importance of physicochemical nature of drugs in drug absorption through gastrointestinal tract. 15 Marks

Q2 a) What is the sampling compartment for measuring drug concentration? Why drug concentration cannot be measured at the receptor site? 4+4 Marks

b) Describe the measurement of bioavailability using the urine data. 12 Marks

Q3 a) Describe, with illustration the method used to calculate the rate for distribution in two compartment open model after I/V administration. 12 Marks

b) What are compartment models? Write down the Pharmacokinetic parameters of non-compartmental analysis. 8 Marks

Q4 a) Which drug types are given through I/V infusion? Describe the Pharmacokinetics parameters necessary for determination of I/V infusion? 15 Marks

b) Describe the factors affecting drug concentration in body during multi-dose drug administration. 5 Marks

Q5 a) What is apparent volume of distribution? Discuss it significance. 6 Marks

b) What are the Disposition parameters required for determination of one compartment open model after oral administration? 14 Marks

Q6 a) Explain which proteins are available in body for drug binding. Describe the significance of protein binding. 6+4 Marks

b) What are the non-hepatic sites for drug biotransformation? Explain Phase II biotransformation reactions with at least one example. 10 Marks

Q7 Write short notes on the following: 6+6+8 Marks
i) Mammillary and Catenary Models ii) Renal Clearance
iii) Pharmacokinetics applications in age-based dose adjustment

UNIVERSITY OF THE PUNJAB

Fourth Prof. 2nd A/2016
Examination: Doctor of Pharmacy (Pharm.D.)

Roll No. .....

Subject: Pharmaceutics-VII (Biopharmaceutics)
PAPER: 4

TIME ALLOWED: 3 hrs.
MAX. MARKS: 100

NOTE: Attempt any FIVE questions. All Questions carry equal marks.

Q1 a) Define the following terms: 5 Marks
i) Persistence factor. ii) Drug disposition.
iii) Therapeutic equivalents. iv) Bioequivalence.
v) Mammillary model.

b) What is Bioavailability? Describe briefly different Pharmaceutical factors affecting the bioavailability of drugs. 15 Marks

Q2 a) Describe the measurement of bioavailability using the blood data. 8 Marks

b) How is the absorption rate constant determined in two compartment open model after oral administration? Demonstrate with illustration. 12 Marks

Q3 a) What is therapeutic drug monitoring? Describe the process of Therapeutic drug monitoring. 2+6 Marks

b) What is Biopharmaceutics? How does Biopharmaceutics affect the dosage form design? 12 Marks

Q4 a) What is the sequence of biotransformation reactions? What are the changes brought about in drug molecules during Phase I and II reactions? 3+3 Marks

b) What is the first pass effect? Describe Phase I biotransformation reactions with at least one example. 4+10 Marks

Q5 a) Explain the difference between drug clearance and drug excretion. 6 Marks

b) Describe protein binding. Describe the kinetics of protein binding. 14 Marks

Q6 a) Which categories of drugs are given through I/V infusion? Describe the Pharmacokinetics parameters to determine I/V infusion? 3+12 Marks

b) Describe volume of distribution. Why is it is called as "apparent? 5 Marks

Q7 Write short notes on the following: 6+8+6 Marks
i) Trapezoidal method ii) Biological half life
iii) Hepatic clearance

UNIVERSITY OF THE PUNJAB

Fourth Prof: A/2017
Examination: Doctor of Pharmacy (Pharm.D.)

Roll No. .....

Subject: Pharmaceutics-VII (Biopharmaceutics) **TIME ALLOWED: 3 hrs.**
PAPER: 4 **MAX. MARKS: 100**

NOTE: Attempt any FIVE questions. All Questions carry equal marks.

Q1	a)	Define the following i) Therapeutic alternatives ii) Bioequivalence iii) Open compartment iv) Mamillary model v) Pharmaceutical substitution	5 Marks
	b)	Describe what types of physicochemical factors are considered in dosage form design.	15 Marks
Q2	a)	Discuss how does the Noyes-Whitney equation explain factors for dissolution.	08 Marks
	b)	Describe the measurement of bioavailability using urine data.	12 Marks
Q3	a)	Describe, with illustration role of residual method in calculation of distribution rate in two compartment open model after I/V route.	12 Marks
	b)	Describe the proteins available for binding of drugs. What is the significance of protein binding?.	5+3 Marks
Q4	a)	Discuss apparent volume of distribution. Why is it called as apparent? Discuss the significance of volume of distribution.	4+2+2 Marks
	b)	Describe the calculation of parameters for one compartment open model after oral administration?	12 Marks
Q5	a)	Which are the categories of drugs given through I/V infusion? Describe the Pharmacokinetics parameters required for determination of I/V infusion?	12 Marks
	b)	Describe the factors affecting blood drug concentration during multi-dose drug administration.	08 Marks
Q6	a)	Describe non-linear pharmacokinetics	10 Marks
	b)	Describe first pass effect? Explain Phase II biotransformation reactions with at least one example.	2+8 Marks
Q7		Write short notes on the following: i) Half life ii) Dose adjustment in renal diseases iii) Conditions requiring therapeutic drug monitoring	6+5+9 Marks

UNIVERSITY OF THE PUNJAB

Fourth Prof: 2nd Annual - 2017
Examination: Doctor of Pharmacy (Pharm.D.)

Roll No. .....

Subject: Pharmaceutics-VII (Biopharmaceutics)
PAPER: 4

TIME ALLOWED: 3 hrs.
MAX. MARKS: 100

NOTE: Attempt any FIVE questions. All Questions carry equal marks.

Q1 a) Define the following: 5 Marks
i) Therapeutic equivalents ii) Closed compartment
iii) Pharmaceutical alternatives iv) Catenary model
v) Pharmacokinetics

b) Describe how does biopharmaceutics effect design of dosage forms 15 Marks

Q2 a) Discuss how do dissolution requirements meet with USP specifications? 8 Marks
b) Discuss design and evaluation of bioequivalence studies. 12 Marks

Q3 a) Describe the process of therapeutic drug monitoring. 8 Marks
b) How is the distribution rate constant determined in two compartment open model after oral administration? Demonstrate with illustration. 12 Marks

Q4 a) What is the significance of I/V infusion? How are steady state concentration (Css), Pre-Css, Post-Css, Elimination rate and Half life are computed for I/V infusion? 3+12 Marks

b) Briefly describe protein binding. What is the significance of protein binding 3+2 Marks

Q5 a) Explain the difference between drug clearance and drug excretion. 8 Marks
b) What is non-linear pharmacokinetics? How does it differ from other kinetic orders? What is its impact on Pharmacokinetics. 4+4+4 Marks

Q6 a) What are the roles of biotransformation? What are the changes brought about in drug molecules during Phase I and II reactions? 3+3 Marks

b) What is the extraction ratio? What is its importance? Describe the factors affecting biotransformation. 3+3+8 Marks

Q7 Write short notes on the following: 5+10+5 Marks
i) Dose consideration in hepatic diseases ii) IVIVC
iii) Flip-flop model

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Fourth Prof: Annual – 2018
Examination: Doctor of Pharmacy (Pharm.D.)

Roll No. .....

Subject: Pharmaceutics-V (Biopharmaceutics & Pharmacokinetics) (New Course)
PAPER: 4 (Part – II)

TIME ALLOWED: 2 Hrs. & 30 min.
MAX. MARKS: 80

Attempt this Paper on Separate Answer Sheet provided.

Attempt any 4 questions. Each question carry equal marks.

Q1	a)	Describe how does biopharmaceutics affect design of dosage forms.	15 Marks
	b)	What are different patient-related factors which influence drug absorption?	5 Marks
Q2	a)	Describe the process of therapeutic drug monitoring.	8 Marks
	b)	Illustrate and give steps to determine the distribution rate constant in two compartment open model after oral administration?	12 Marks
Q3	a)	How are steady state concentration (C_{ss}), Pre-C_{ss}, Post-C_{ss}, Elimination rate and Half-life are computed for I/V infusion after one compartment model?	10 Marks
	b)	Describe different designs of Dosage Regimens?	10 Marks
Q4	a)	Explain the difference between drug clearance and drug excretion.	8 Marks
	b)	What is non-linear pharmacokinetics? How does it differ from other kinetic orders? What is its impact on Pharmacokinetics?	4+4+4 Marks
Q5	a)	Define IVIVC. Describe its significance.	2+6 Marks
	b)	Define non-compartmental approach? Describe trapezoidal method for area under the curve. Give formula for extrapolated AUMC ($AUMC_{0-\infty}$).	2+6+4 Marks
Q6		Write short notes on the following: i) Factors influencing drug variability ii) pH-partition theory iii) Flip-flop model	8+8+4 Marks

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UNIVERSITY OF THE PUNJAB

Roll No. .....

Fourth Prof: Annual – 2018

Examination: Doctor of Pharmacy (Pharm.D.)

Subject: Pharmaceutics-V (Biopharmaceutics & Pharmacokinetics) (New Course)

TIME ALLOWED: 30 min.
MAX. MARKS: 20

PAPER: 4 Part – I (Compulsory)

Attempt this Paper on this Question Sheet only.

Please encircle the correct statement. Each MCQ carries 1 Mark. This Paper will be collected back after expiry of time limit mentioned above.

1. **Lag-time is the time needed for a drug to reach at:**
   (A. lower therapeutic blood level (B. measurable level in blood (C. maximum effect after intake (D. level to start pharmacological response
2. **Protein binding causes transitorily:**
   (A. increased drug potency (B. elevated metabolism (C. drug inactivation (D. increased pharmacological effect
3. **Change in rate of drug absorption changes values of pharmacokinetics parameter:**
   (A. C_{max} (B. T_{max} (C. area under the curve (D. half life
4. **Change in extent of absorption alters the value of:**
   (A. area under the curve (B. T_{max} (C. rate of absorption (D. all A, B and C
5. **Tissue or group of tissues, in compartmental approach is considered as:**
   (A. compartment I (B. central compartment (C. peripheral compartment (D. accessible compartment
6. **Drug products containing the same therapeutic moiety but different salts, dosage forms or strengths are:**
   (A. pharmaceutical equivalents (B. pharmaceutical alternatives (C. therapeutic alternatives (D. therapeutic equivalents
7. **Comparative areas under the curves (AUCs) after oral and I/V administration is called:**
   (A. absolute bioavailability (B. bioequivalence (C. relative bioavailability (D. Bioavailability
8. **In equation, $C_t = Be^{-\beta t}$, β is:**
   (A. theoretical initial concentration (B. y-intercept (C. last concentration (D. slope of the curve
9. **Number of compartment is decided from the following portion of the plasma level time profile:**
   (A. disposition curve (B. elimination curve (C. distribution curve (D. absorption curve
10. **Method of residual in 2 compartment open model after I/V administration is used to calculate:**
    (A. absorption rate (B. distribution rate (C. elimination rate (D. y-intercept of extrapolated curve
11. **Which of the following is NOT relevant for AUMC? AUMC is a:**
    (A. zero moment (B. parameter indicating absorption (C. non-compartmental parameter (D. statistical moment
12. **The equation, $C_t = Ae^{-\alpha.t} + B^{-\beta.t}$ calculates unknown concentration at any time in:**
    (A. 1 compartment model after IV administration (B. 2 compartment model after I/V administration
    (C. 2 compartment model after E/V administration (D. 1 compartment model after E/V administration
13. **Therapeutic drug monitoring is necessary in following situations EXCEPT when a drug has:**
    (A. narrow therapeutic index (B. non-linear pharmacokinetics (C. concentration in blood, unrelated to clinical outcome (D. large individual variation in blood concentration
14. **The major parameter(s) in establishing a dosage regimen is/are:**
    (A. size of drug (dose) (B. administration frequency (τ) (C. C_{max} (D. both A and B
15. **The aim of multiple dose is to achieve drug concentration which provides the following EXCEPT:**
    (A. no drug accumulation (B. minimum fluctuations (C. increased bioavailability (D. maintained concentration
16. **A drug showing poor solubility and poor permeability belongs to biopharmaceutical classification system:**
    (A. Class I (B. Class II (C. Class III (D. Class IV
17. **In multiple dosing, higher accumulation of drug is expected if a drug has:**
    (A. smaller rate of elimination (B. longer half life (C. smaller clearance (D. all A, B, and C
18. **Which drug is more soluble in intestine by forming a soluble salt at more alkaline pH?**
    (A. Acidic (B. Neutral (C. Basic (D. Chelate
19. **The amount of solid substance that goes into solution per unit time under standard conditions is:**
    (A. dissolution (B. solubility (C. disintegration (D. miscibility
20. **Method of residual in 2-compartment model after IV administration resolves plasma level curve into:**
    (A. 1-linear phase (B. 2-linear phases (C. 1-linear and 1-nonlinear phase (D. 2-non-linear phase

UNIVERSITY OF THE PUNJAB

Fourth Prof: 2nd Annual – 2018

Examination: Doctor of Pharmacy (Pharm.D.)

Roll No. .....

Subject: Pharmaceutics-V (Biopharmaceutics & Pharmacokinetics) (New Course)

PAPER: 4 Part – II

MAX. TIME: 2 Hrs. 30 Min.

MAX. MARKS: 80

ATTEMPT THIS (SUBJECTIVE) ON THE SEPARATE ANSWER SHEET PROVIDED

Attempt any FOUR questions. All questions carry equal Marks

Q1	a)	Describe what types of physicochemical factors are considered in dosage form design.	14 Marks
	b)	Discuss how does the Noyes-Whitney equation explain factors for dissolution.	06 Marks
Q2	a)	Illustration with steps the role of residual method for calculation of distribution rate constant in two compartment open model after I/V route.	12 Marks
	b)	Describe the proteins available for binding of drugs. What is the significance of protein binding?	5+3 Marks
Q3	a)	Discuss apparent volume of distribution. Why is it called as apparent? Discuss the significance of volume of distribution.	4+2+2 Marks
	b)	Describe the calculation of parameters for one compartment open model after oral administration?	12 Marks
Q4	a)	Describe calculation of the Pharmacokinetics parameters required for determination of I/V infusion assuming one compartment model?	12 Marks
	b)	Describe Persistence Factor, Accumulation Factor and Loss factor during multiple dosing.	08 Marks
Q5	a)	Describe non-linear pharmacokinetics	10 Marks
	b)	Describe first pass effect? Explain Phase II biotransformation reactions with at least one example.	2+8 Marks
Q6		Write short notes on the following: i) Mean residence time (MRT) ii) Level A correlation iii) Dosage considerations in elderly and obese patients	4+8+8 Marks

UNIVERSITY OF THE PUNJAB

Fourth Prof: 2nd Annual – 2018

Examination: Doctor of Pharmacy (Pharm.D.)

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Signature of Supdt.:

Subject: Pharmaceutics-V (Biopharmaceutics & Pharmacokinetics) (New Course)

PAPER: 4 Part – I (Compulsory)

MAX. TIME: 30 Min.

MAX. MARKS: 20

Attempt this Paper on this Question Sheet only.
Please encircle the correct option. Division of marks is given in front of each question.
This Paper will be collected back after expiry of time limit mentioned above.

Q.1. Encircle the right answer cutting and overwriting is not allowed. (1x20=20)

1. Tetracycline phosphate and tetracycline HCl are:
(A. therapeutic equivalents (B. therapeutic alternatives (C. pharmaceutical alternatives (D. pharmaceutical equivalents
2. Ratio of $AUMC_{0-\infty}$ to $AUC_{0-\infty}$ is:
(A. mean resident time (B. average concentration (C. relative bioavailability (D. persistent factor
3. Two independent compartments connected to a central compartment is a model called:
(A. open model (B. flip-flop model (C. catenary model (D. mammillary model
4. The following is NOT the feature of non-compartmental model. The non-compartmental models are:
(A. assumption free (B. require algebraic equations (C. applicable only to non-linear PK (D. not requiring curve fitting
5. The theoretical initial drug concentration in 1-compartment model after I/V administration is equal to:
(A. concentration at last time (B. y-intercept (C. zero (D. summation of y-intercepts, A and B
6. The compartment models have the features EXCEPT.
(A. assume concentration as statistical distribution (B. concentration time data is the expression of exponents (C. requires tedious computation (D. assume that data follow first order kinetics
7. The parameters required to proclaim bioequivalence between two dosage forms of a single drug are:
(A. AUC and $t_{1/2}$ (B. C_{max} and K_{el} (C. C_{max} and Cl_T (D. AUC, C_{max} and T_{max}
8. Following is not applicable to blood drug concentration data following Michaelis-Menten's kinetics?
(A. Equations for the linear Pharmacokinetics (B. Concept of compartment model (C. Enzyme kinetics theory (D. Maximal rate of elimination
9. A drug showing good solubility and poor permeability belongs to Biopharmaceutical Classification System:
(A. Class I (B. Class II (C. Class III (D. Class IV
10. Flip flop kinetics is observed when:
(A. $K_a > K_{el}$ (B. $K_{el} > K_a$ (C. $K_a = K_{el}$ D.) None of A, B and C
11. According to pH-partition theory, the following drug is more absorbable:
(A. ionized (B. unionized (C. hydrophilic (D. highly charged
12. Protein binding affects:
(A. lag time (B. absorption (C. volume of distribution (D. All A, B and C
13. In the equation, Y=b+mx, m represents:
(A. concentration or parameter on y-axis (B. slope of the curve (C. y-intercept (D. time
14. Which of the drugs mostly binds to albumin?
(A. basic (B. anionic (C. acidic (D. nonionic
15. The two phases of decline elimination on Michaelis Menten kinetics plot correspond to:
(A. first order-zero order (B. zero order-zero order (C. first order-first order (D. zero order-first order
16. The total drug excreted in urine is the amounts:
(A. filtered + secreted – reabsorbed (B. filtered + secreted + reabsorbed (C. filtered – secreted + reabsorbed (D. filtered – secreted – reabsorbed
17. The systemic absorption of a drug, given via intravascular route is:
(A. 1% (B. 100% (C. 50% (D. 75%
18. For very poor aqueous soluble drug, the rate limiting step is:
(A. dissolution (B. rate of dissolution (C. rate of absorption (D. both A and B
19. The time a drug takes to reach minimum effective concentration is:
(A. lag time (B. time to reach steady state concentration (C. onset time of action (D. time for duration of action
20. Volume of distribution is a parameter for:
(A. distribution (B. metabolism (C. absorption (D. excretion

UNIVERSITY OF THE PUNJAB

Fourth Prof: 2nd Annual – 2018

Examination: Doctor of Pharmacy (Pharm.D.)

Roll No. .....

Subject: Pharmaceutics-VII (Biopharmaceutics) (Old Course)
PAPER: 4

MAX. TIME: 3 Hrs.
MAX. MARKS: 100

NOTE: Attempt any FIVE questions. All questions carry equal marks.

Q. 1	a)	Define the following terminologies: I) Biopharmaceutics II) Therapeutic equivalent III) Loss factor IV) Steady state concentration V) Area under the first moment curve (AUMC)	10 Marks
	b)	What is relative bioavailability? Briefly describe how bioavailability of a drug is determined using urine data.	10 Marks
Q. 2	a)	Define dissolution. Describe how dissolution requirements meet with the USP-NF specifications?	10 Marks
	b)	Describe the significance of plasma protein binding and also discuss the types of plasma proteins involved in drug protein binding.	10 Marks
Q. 3	a)	What is extraction ratio? Give its importance. Describe Phase I reactions in biotransformation with at least one example.	3+2+9 Marks
	b)	Discuss applications of pharmacokinetics in Dose adjustment, Elderly patients and Therapeutic drug monitoring.	6 Marks
Q. 4	a)	What is apparent volume of distribution? Describe significance of the volume of distribution	12 Marks
	b)	Discuss the pharmacokinetic changes occurred during hepatic impairments and the dose adjustment in hepatic impairment.	8 Marks
Q. 5	a)	Describe the open and closed compartment models. Which compartment model is logical in pharmacokinetics?	6 Marks
	b)	Demonstrate, with illustration the calculation of absorption rate constant for two compartment oral model.	14 Marks
Q. 6	a)	Describe clearance? How does the clearance differ from excretion?	10 Marks
	b)	Discuss pharmacokinetics of intravenous infusion and calculate elimination rate constant of IV infusion.	10 Marks
Q. 7		Write note on the following: I) Flip-flop model II) Trapezoidal method III) Mammillary and catenary models	8+4+8 Marks

UNIVERSITY OF THE PUNJAB

Doctor of Pharmacy (Pharm.D.) Fourth Prof: Annual–2019

Subject: Pharmaceutics-V (Biopharmaceutics & Pharmacokinetics)

Paper: 4 Part – I (Compulsory) (New Course) Time: 30 Min. Marks: 20

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Roll No. in Words. .....

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Signature of Supdt.:

ATTEMPT THIS PAPER ON THIS QUESTION SHEET ONLY.

Division of marks is given in front of each question.

This Paper will be collected back after expiry of time limit mentioned above.

Q.1. Encircle the correct option. (20x1=20)

1. **To be soluble, a drug must be:**
   (A. unionized (B. with similar pH to environment (C. lipophilic (D. ionized
2. **The difference between the times for a drug to reach MEC and then decline back to MEC is:**
   (A. onset of action (B. action duration (C. intensity of action (D. therapeutic window
3. **Therapeutic drug monitoring is applicable when a relationship exists between drug concentration in:**
   (A. receptor and drug action (B. receptor and toxic effects (C. tissue and toxic effects (D. blood and adverse effect
4. **Different classes of drugs but with similar indications are:**
   (A. pharmaceutical equivalent (B. pharmaceutical alternative (C. therapeutic alternative (D. therapeutic equivalent
5. **The following statement is true for non-compartmental pharmacokinetic approach, it:**
   (A. does not require non-linear regression (B. requires detailed description of disposition (C. is sensitive to sampling intervals (D. estimates distribution rate constants
6. **The following statement is NOT true for compartmental pharmacokinetic approach, it is:**
   (A. based on first order kinetics (B. majorly assumption based (C. solved by simple algebraic equations
   (D. equally applicable to linear and non-linear pharmacokinetics
7. **Individualization of dose regimen is implemented for drugs EXCEPT that:**
   (A. have narrow therapeutic window (B. follow non-linear pharmacokinetics (C. exhibit relationship between plasma concentration and clinical effect (D. have narrow inter- and intra- subject variability
8. **Linear pharmacokinetics has the characteristics, EXCEPT:**
   (A. it follows 1st order kinetics (B. increased dose corresponds to increased peak concentration (C. increased dose causes proportionally increased area under the curve (D. elimination deviates the exponential decline
9. **In calculating AUC for model, $C_t = Ae^{-\alpha t} + Be^{-\beta t}$, the first concentration in plasma is equivalent to:**
   (A. zero (B. y-intercept (C. concentration at Y1 on plasma time cure (D. concentration at Y2 on plasma time cure
10. **Change in rate of absorption alters the value of:**
    (A. AUC (B. T_{max}) (C. C_{max} (D. all A, B and C
11. **In IVIVC, the level B correlation:**
    (A. is point to point (B. reflects biowaiver (C. drug dissolution reflects absorption (D. uses mean from entire data
12. **Tissue or group of tissues, in compartmental approach is considered as:**
    (A. compartment I (B. central compartment (C. peripheral compartment (D. accessible compartment
13. **Number of compartments is decided from the following portion of the plasma level time profile:**
    (A. disposition curve (B. elimination curve (C. distribution curve (D. absorption curve
14. **Method of residual in 2 compartment open model after I/V administration is used to calculate:**
    (A. absorption rate (B. distribution rate (C. elimination rate (D. absorption half life
15. **AUC is NOT:**
    (A. non-compartmental parameter (B. absorption parameter (C. first moment (D. calculated by trapezoidal rule
16. **A drug showing poor solubility and high permeability belongs to biopharmaceutical classification system:**
    (A. Class I (B. Class II (C. Class III (D. Class IV
17. **The amount of solid substance that goes into solution per unit time under standard conditions is:**
    (A. dissolution (B. solubility (C. disintegration (D. miscibility
18. **Method of residual in 2-compartment model after IV administration resolves plasma level curve into:**
    (A. 1 linear phase (B. 2 linear phases (C. 1 linear and 1 nonlinear phase (D. 2 non-linear phases
19. **In IV infusion, increase in blood concentration does NOT depend on:**
    (A. half-life (B. C_{ss} value (C. absorption rate (D. elimination rate
20. **Half-life depends on:**
    (A. clearance (B. volume of distribution (C. peak concentration (D. Both A and B

UNIVERSITY OF THE PUNJAB

Doctor of Pharmacy (Pharm.D.) Fourth Prof: Annual–2019

Roll No. .....

Subject: Pharmaceutics-V (Biopharmaceutics & Pharmacokinetics) (New Course)
Paper: 4 Part – II

Time: 2 Hrs. 30 Min. Marks: 80

ATTEMPT THIS (SUBJECTIVE) ON THE SEPARATE ANSWER SHEET PROVIDED

Note: Attempt any *FOUR* questions. Each question carries equal marks.

Q. 2	a)	Describe how do pharmaceutical factors affect drug bioavailability?	14 Marks
	b)	What is the sampling compartment from where drug concentration is measured most frequently? Give the reasons why concentration is not measured from the receptor compartment?	3+3 Marks
Q. 3	a)	Describe the determination of bioavailability using urine data.	8 Marks
	b)	Illustrate the determination of absorption rate in one open compartment model after oral administration.	12 Marks
Q. 4	a)	What categories of drugs are given though IV infusion? Describe the calculation of steady state concentration (C_{ss}), Pre-C_{ss}, Post-C_{ss}, Elimination rate and Half life for IV infusion after one compartment model.	2+10 Marks
	b)	What is a persistence factor? Compute the persistence factor for a drug with half life of 4 h for a dose administered at: (I) every 8 h, and (II) every 12 h.	2+6 Marks
Q. 5	a)	Describe the process of therapeutic drug monitoring.	8 Marks
	b)	Discuss methods of dose adjustment based on drug clearance and Elimination rate in renal disease.	12 Marks
Q. 6	a)	What is IVIVC? Describe the significance of IVIVC.	2+6 Marks
	b)	Briefly describe the basis of non-compartmental approach? Describe trapezoidal method for area under the curve. Give formula for extrapolated AUMC ($AUMC_{t-\infty}$).	2+6+4 Marks
Q. 7		Write short notes on the following: I) Drug clearance and excretion II) Multi peak phenomenon III) Non-linear Pharmacokinetics	8+4+8 Marks

UNIVERSITY OF THE PUNJAB

Doctor of Pharmacy (Pharm.D.) Fourth Prof: Annual–2019

Roll No. .....

Subject: Pharmaceutics-VII (Biopharmaceutics) (Old Course)
Paper: 4

Time: 3 Hrs. Marks: 100

Note: Attempt any *FIVE* questions. Each question carries equal marks.

Q. 1 **a)** Define the following terminologies: 5 Marks
I) Pharmacokinetics II) Relative bioavailability
III) Mamillary model IV) Mean residence time
V) Dissolution

b) Describe how the bioavailability of a drug is determined using blood data. 15 Marks

Q. 2 **a)** Describe different steps involved in absorption? Discuss the rate limiting steps in drug absorption. 6 Marks

b) Describe the physicochemical characteristics of drug affecting its absorption. 14 Marks

Q. 3 **a)** Discuss calculation of pharmacokinetics parameters of a drug after its intravenous infusion. 12 Marks

b) Discuss the parameters of multiple dose regimens. 8 Marks

Q. 4 **a)** Briefly describe the computation of pharmacokinetic parameters for one compartment open model after IV bolus administration. 8 Marks

b) Demonstrate, with illustration the calculation of absorption rate constant for oral one compartment open model. 12 Marks

Q. 5 **a)** Briefly discuss total body clearance. How drug clearance differs from drug excretion? 08 Marks

b) Define biotransformation. Describe phase II biotransformation reactions with at least one example. 12 Marks

Q. 6 **a)** Discuss different approaches for dose adjustment in renal disease 12 Marks

b) Define protein binding. What are different types of proteins involved in drug protein binding? Explain clinical significance of plasma protein binding. 8 Marks

Q. 7 Write brief notes on the following: 8+4+8 Marks
I) Therapeutic monitoring II) First pass effect
III) Volume of distribution

UNIVERSITY OF THE PUNJAB

Doctor of Pharmacy (Pharm.D.) Fourth Prof: Annual–2021

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Signature of Supdt.:

Subject: Pharmaceutics-V (Biopharmaceutics & Pharmacokinetics)

Paper: 4 Part – I (Compulsory) (New Course) Time: 30 Min. Marks: 20

ATTEMPT THIS PAPER ON THIS QUESTION SHEET ONLY.

Division of marks is given in front of each question.

This Paper will be collected back after expiry of time limit mentioned above.

Q.1. Encircle the correct option. (20x1=20)

1. **Aging has been associated with the increased:**
   (a) extracellular fluid volume (b) hepatic blood flow (c) subcutaneous fat (d) size of lung's alveolar ducts
2. **With reference to the renal function and pharmacokinetics, in geriatrics the:**
   (a) serum creatinine remains normal due to decreased muscle mass (b) Glomerular function always declined (c) tubular secretions remain unchanged (d) 1.5 mg/dl serum creatine reflects normal renal function
3. **An appropriate drug dosing strategy for obese patients in computed based on the:**
   (a) normal methods (b) total body water for loading dose (c) total body water for maintenance dose (d) modified weight combined with TDM
4. **Two compartments, connected independently to the central compartment make a:**
   (a) Caternary model (b) flip-flop model (c) closed model (d) mammillary model
5. **The following drug is more soluble in the intestine, forming a soluble salt at more alkaline pH:**
   (a) acidic (b) neutral (c) basic (d) chelate
6. **The pharmacokinetic process affected the most, by plasma or tissue protein binding is:**
   (a) absorption (b) distribution (c) elimination (d) metabilism
7. **Increase in the free drug concentration causes increase in volume of distribution which is:**
   (a) maximum (b) permanent (c) transient (d) rapid
8. **The fat-soluble vitamins are absorbed by:**
   (a) active transport (b) endocytosis (c) porte transport (d) facilitated diffusion
9. **For systemic absorption, the unionized drug must be:**
   (a) hydrophilic (b) fast dissolving (c) lipophilic (d) neutral
10. **The volume of distribution relates:**
    (a) drug in body to drug in plasma (b) drug dose to plasma drug (c) drug concentration to toxicity (d) dose to pharmacodynamics
11. **A biphasic decline in oral route of administration indicates:**
    (a) absorption and distribution (b) absorption and elimination (c) disposition (d) absorption and elimination
12. **The AUC gives an idea about:**
    (a) absorption rate (b) absorption extent (c) subtherapeutic concentration (d) drug distribution
13. **The BCS Class II drugs have:**
    (a) poor solubility (b) high solubility (c) lower permeability (d) both a and c
14. **The bioequivalence parameters are:**
    (a) C_{max} and K_{el} (b) C_{max} and Cl_T (c) AUC, C_{max} and T_{max} (d) AUC and $t_{1/2}$
15. **The systemic drug absorption after oral administration is usually:**
    (a) unmeasurable (b) less than 100% (c) equals 100% (d) exceeds 100%
16. **The time between drug administration and absorption is:**
    (a) onset time (b) lag time (c) peak time (d) mean residence time
17. **The initial concentration after IV route in saturation kinetics is measured from extrapolated line at the:**
    (a) top left (b) bottom right (c) curved position (d) y-intercept of residual curve
18. **Dose adjustment does NOT based on:**
    (a) clearance (b) half life (c) elimination rate (d) area under the curve
19. **Dose given to facilitate achieving steady state earlier is the:**
    (a) loading dose (b) maintenance dose (c) steady state dose (d) minimum effective dose
20. **The disposition phase on saturation kinetic plot corresponds the:**
    (a) first order-zero order (b) zero order-first order (c) zero order-zero order (d) first order-first order

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Roll No. .....

Doctor of Pharmacy (Pharm.D.) Fourth Prof: Annual–2021

Subject: Pharmaceutics-V (Biopharmaceutics & Pharmacokinetics) (New Course)

Time: 2 Hrs. 30 Min. Marks: 80

Paper: 4 Part – II

ATTEMPT THIS (SUBJECTIVE) ON THE SEPARATE ANSWER SHEET PROVIDED

Note: Attempt any *FOUR* questions. Each question carries equal marks.

Q.2. a) Describe the drug physicochemical characteristics that are taken into consideration during drug product design — 12 Marks

b) How the drug binds with proteins. Discuss proteins involved in the binding of the drugs? — 8 Marks

Q.3. a) What are the characteristics of candidate drugs for Therapeutic Drug Monitoring? — 8 Marks

b) Layout a procedure to determine the distribution rate constant in two compartment open model after IV administration? — 12 Marks

Q.4. a) Which drugs are given through the IV infusion? How the pharmacokinetic parameters are computed for the I/V infusion after one compartment model? — 10 Marks

b) Describe different designs of dosage regimens? — 10 Marks

Q.5. a) Explain the difference between drug clearance, drug metabolism and drug excretion. — 8 Marks

b) Describe the impact of saturation in the disposition of the drugs — 12 Marks

Q.6. a) Give the mathematical expressions for maximum and minimum concentration of any dose during multiple dosing. — 12 Marks

b) What is statistical moment theory? How the area under the first moment of plasma level time curve is measured?. — 2+6 Marks

Q.7. Write short notes on the following: — 8+7+5 Marks

i) Phase II metabolic reactions

ii) pH-partition theory

iii) Dose considerations in elderly patients