Subject: Biopharmaceutics and Pharmacokinetics (BP604T)

Class : Third Year B.Pharm. (Sem-VI) R-2019

Question Bank

Q. I	**Multiple Choice Questions.** **(1 Mark Each)**
1.	_____ helps in transporting of inorganic ions across the membrane
a)	**Aqueous filled pores**
b)	Voltage gated channels
c)	Ion channels
d)	Diffusion
2.	The bioavailability of a drug from various dosage forms decreases in the following order:
a)	Tablets > Coated Tablets > Sustained Release Products >Enteric Coated Tablets
b)	**Tablets > Coated Tablets > Enteric Coated Tablets > Sustained Release Products.**
c)	Tablets >Enteric Coated Tablets > Coated Tablets > Sustained Release Products.
d)	Enteric Coated Tablets >Tablets > Coated Tablets > Enteric Coated Tablets > Sustained Release Products.
3.	Select the probable mechanism of absorption of a hydrophilic drug of molecular weight 80 dalton
a)	Active transport
b)	**Filtration**
c)	Passive diffusion
d)	Endocytosis
4.	The movement of drug between one compartment and other like blood or extravascular tissue is referred to as
a)	Drug Disposition
b)	**Drug Distribution**
c)	Drug Binding
d)	Drug Elimination
5.	Amorphous form of Novobiocin is

a)	**10 times more soluble than crystalline form**
b)	10 times less soluble than crystalline form
c)	Physical form does not affect solubility
d)	Novobiocin solubility is not affected by its physical form
6.	The cell membrane is
a)	**Semipermeable**
b)	Impermeable
c)	Permeable
d)	Permeable only to gases
7.	What is the correct order of bioavailability of different dosage forms?
a)	Solutions > Emulsion > Capsules > Tablet > SR Tablet
b)	**Solutions > Emulsion > Tablet > Capsules > SR Tablet**
c)	Emulsion > Solutions > Tablet > Capsules > SR Tablet
d)	Emulsion > Solutions > Capsules > Tablet > SR Tablet
8.	Oral bioavailability of a drug depends upon
a)	Half life of drug
b)	Rate of elimination
c)	Rheology of GI fluid
d)	**Extent of absorption & first pass effect**
9.	Clearance is
a)	**Hypothetical volume of body fluids containing drug from which the drug is completely removed in specified period of time.**
b)	Time period in which drug is completely removed from body.
c)	Amount of drug that is completely removed from body in specified period of time.
d)	Fraction of drug that is completely removed from body in specified period of time.
10.	Fick's law is used for study of
a)	Dissociation Rate

b)	Dissolution Rate
c)	Disintegration rate
d)	**Diffusion Rate**
11.	Comparison of Bioavailability between two dosage form is known as
a)	Biological
b)	Absolute bioavailability
c)	**Bioequivalence**
d)	Biopharmaceutics
12.	Which statement about Biopharmaceutical Classification System is true?
a)	**Class II- Low solubility, High permeability, Class III- High solubility, Low permeability**
b)	Class II- High solubility, High permeability, Class III- High solubility, High permeability
c)	Class II- Low solubility, Low permeability, Class III- Low solubility, Low permeability
d)	Class II- High solubility, Low permeability, Class III- Low solubility, High permeability
13.	Conjugation of drug is
a)	**Coupling with endogenous substance**
b)	Reduction by special enzymes
c)	Oxidation by special oxidase
d)	Solubilization in lipids
14.	_____ Involves the engulfment of small molecules or fluid
a)	Endocytosis
b)	**Pinocytosis**
c)	Phagocytosis
d)	None of the above
15.	PEG 6000 is deleterious binder for phenobarbitone because
a)	**it forms poorly absorbable complex with drug**
b)	it has no binding action

c)	it shows formulation defects
d)	It affects stability
16.	Absorption mechanism through rectal route is
a)	Endocytosis
b)	Facilitated diffusion
c)	**Passive diffusion**
d)	Pore transport
17.	Very weak acids like barbiturates having pka value greater than 8 will remain ---------- in all pH values of GIT
a)	Ionised
b)	**Unionised**
c)	Neutral
d)	Ion pair
18.	In the sequence of events in drug absorption from orally administered tablet, which one comes at first
a)	**Disintegration**
b)	Deaggregation
c)	Dissolution
d)	Absorption
19.	Apparent volume of distribution is _____
a)	Plasma drug concentration X amount of drug in body
b)	Plasma drug concentration / amount of drug in body
c)	Amount of drug in the body X plasma drug concentration
d)	**Amount of drug in the body /plasma drug concentration**
20.	IP type II dissolution apparatus is
a)	Paddle
b)	**Basket**
c)	Flow through cell

d)	Reciprocating cylinder
21.	Flow Through Cell is official
a)	USP Dissolution Test Apparatus II
b)	USP Dissolution Test Apparatus III
c)	**USP Dissolution Test Apparatus IV**
d)	USP Dissolution Test Apparatus V
22.	Transfer of drug from plasma to tissue depends on
a)	**Blood perfusion rate of tissue**
b)	Weight of tissue
c)	Size of tissue
d)	Gastric emptying rate
23.	In case of multiple IV injections, the ratio of steady state concentration to initial concentration is called as
a)	**Accumulation factor**
b)	Maxima
c)	Minima
d)	Absorption factor
24.	Paracellular transport means
a)	**Passage of drugs across GI membrane**
b)	Transport of drugs through the junctions between the GI epithelial cells.
c)	It is not a mode of transport of drugs
d)	The permeation of drugs through temporary openings of two neighbouring epithelial cells into the lumen
25.	Glomerular Filtration is
a)	Non selective Multidirectional process
b)	Selective Unidirectional process
c)	**Non selective Unidirectional process**
d)	Selective Multidirectional process

26.	Dissolution rate is
a)	**Amount of solid substrate that goes into solution under constant time under standard temperature, pH, solvent composition and constant surface area**
b)	Amount of solid substrate that goes into solution under constant time under standard temperature
c)	Amount of solid substrate that goes into solution under constant time under standard temperature, pH, and pressure
d)	Amount of solid substrate that goes into solution under constant time
27.	Renal Clearance is expressed as
a)	**Rate of urinary excretion/ plasma drug concentration**
b)	Elimination rate/ Plasma drug concentration
c)	plasma drug concentration / Rate of urinary excretion
d)	Plasma drug concentration / Elimination rate
28.	In case of polymorphic drug form of drug is preferred
a)	stable
b)	Unstable
c)	**Metastable**
d)	Any form
29.	Poorly developed BBB is observed in
a)	**Infants**
b)	Adults of age more than 20 years
c)	Elderly
d)	Children at puberty
30.	Bioavailability of drug can be calculated by using which parameter?
a)	Total systemic clearance
b)	Volume of distribution
c)	**Area Under the Curve**
d)	Absorption rate Constant
31.	Principal site of oral absorption is

a)	**Small intestine**
b)	Stomach
c)	Large intestine
d)	Rectum
32.	The order of dissolution of different solid forms of drugs is:
a)	**amorphous > Metastable >Stable**
b)	amorphous > Stable > Metastable
c)	Stable > amorphous > Metastable
d)	Metastable > amorphous >Stable
33.	Penetration through blood brain barrier is complicated because of
a)	Meningitis
b)	Rapid clearance from blood brain barrier
c)	**Absence of pores in the brain capillary endothelium**
d)	High lipid solubility of drugs
34.	The term used to denote that the drug substance in two or more identical dosage forms, reaches the systemic circulation at the same relative rate and to the same relative extent is
a)	Pharmaceutical equivalence
b)	Chemical Equivalence
c)	Therapeutic Equivalence
d)	**Bioequivalence**
35.	The inhibitory effect of various acids on gastric emptying decreases in following order:
a)	**HCl > acetic > lactic > tartaric > citric**
b)	citric > tartaric > HCl > acetic > lactic
c)	lactic> HCl > acetic > tartaric > citric
d)	acetic > HCl > lactic > tartaric > citric
36.	Type IV USP Dissolution test apparatus is___
a)	Rotating Paddle

b)	**Flow through Cell**
c)	Reciprocating cylinder
d)	Paddle over disc
37.	In presence of food, absorption of griseofulvin is
a)	delayed
b)	decreased
c)	**increased**
d)	unaffected
38.	Nephron is functional unit of
a)	Liver
b)	Lung
c)	Heart
d)	**Kidney**
39.	Biowaivers are applicable for
a)	**BCS class I Drugs**
b)	BCS Class III Drugs
c)	Drugs with narrow therapeutic index
d)	Sublingual or buccal tablet
40.	Interfacial barrier model is also known as
a)	**Limited solvation theory**
b)	Danckwert model
c)	Noyes–Whitney Relationship
d)	Hixon–Crowell Cube Root Law
41.	What happens when an obese person is given a lipophilic drug
a)	**High adipose tissue take up most of the lipophilic drug**
b)	Drug aggregation will begin

c)	He cannot absorb lipophilic drugs
d)	Drug will be accumulated in the liver
42.	In catenary model, compartments are joined _____
a)	**in series**
b)	in parallel
c)	clustered
d)	like planetary system
43.	_____ organ has very low perfusion rate
a)	**Bone**
b)	Kidney
c)	Lungs
d)	Liver
44.	Which of the following statement is true?
a)	**Drugs with high protein binding have apparently low volume of distribution**
b)	Drugs with low protein binding have apparently low volume of distribution
c)	Drugs with high protein binding have apparently high volume of distribution
d)	Drugs with low protein binding have apparently low volume of distribution
45.	A Multicompartment model assumes all rate constants are
a)	Zero order
b)	**First order**
c)	Mixed order
d)	Pseudo first order
46.	Which of the following statements is true?
a)	Rate of excretion = Rate of filtration - Rate of Secretion - Rate of reabsorption
b)	Rate of excretion = Rate of filtration -Rate of Secretion + Rate of reabsorption
c)	**Rate of excretion = Rate of filtration +Rate of Secretion - Rate of reabsorption**

d)	Rate of excretion = Rate of filtration +Rate of Secretion + Rate of reabsorption
47.	Pharmacokinetics is study of kinetics of
a)	Method of new drug development
b)	Pharmacological effect of drugs
c)	Mechanism of drug action
d)	**Absorption, distribution, metabolism and excretion of drugs**
48.	In _____ compartments are joined in series
a)	Distributed parameter model
b)	**Catenary model**
c)	Physiologic model
d)	Mammillary model
49.	As per mammillary model, the number of rate constants that will appear in a particular compartment model (for intravenous administration) is given by
a)	**R= 2n – 1**
b)	R= 2n
c)	R= 2n +1
d)	R= 2n -2
50.	_____ absorption mechanism involves engulfing of the extracellular drug
a)	**Endocytosis**
b)	Passive diffusion
c)	Facilitated diffusion
d)	Ion-Pair transport
51.	Model independent approach is also termed as
a)	**Non-compartmental approach**
b)	Compartment model
c)	Physiological model
d)	Distributed parameter model

52.	What will be the apparent volume of distribution of warfarin
a)	**The apparent volume of distribution is less than the total body water**
b)	The apparent volume of distribution is more than the total body water
c)	The apparent volume of distribution is equal to the total body water
d)	There is no correlation between apparent and true volume of distribution
53.	Select the equation that gives the rate of drug dissolution from a tablet
a)	Fick's law
b)	Handerson Hasselbatch equation
c)	**Noyes Whitney equation**
d)	Michelis Menten equation
54.	Non compartmental analysis model is based on
a)	Blood perfusion to the organ
b)	Physiological organs
c)	Drug diffusion to organ
d)	**Statistical moments theory**
55.	_____ is the initial higher dose given to achieve steady state plasma concentration instantaneously
a)	Primary dose
b)	Therapeutic dose
c)	Maintenance dose
d)	**Loading dose**
56.	Which organ can be the part of central compartment _____
a)	Muscle
b)	Bones
c)	**Lungs**
d)	Adipose tissue
57.	Favourable pH range for absorption through small intestine is

a)	1 to 2.5
b)	4 to 4.5
c)	**5 to 7.5**
d)	10- 12.5
58.	Application of principles of pharmacokinetics to suit individual patient need is called
a)	Acute pharmacologic response
b)	**Clinical pharmacokinetics**
c)	Pharmacokinetics
d)	Pharmacodynamics
59.	Select structure specific mechanism of drug absorption
a)	**Facilitated diffusion**
b)	Passive diffusion
c)	Endocytosis
d)	Pinocytosis
60.	Disposition of a drug that follows one compartment kinetics is shown be equation:
a)	$X = X_o e^{-K_E T}$
b)	$X = X_o e^{-Cl.T}$
c)	$\mathbf{X = X_. e^{-K_E T}}$
d)	$X = X_. e^{-CL.T}$
61.	Interfacial barrier model states that
a)	**An intermediate concentration exists at the interface**
b)	Turbulence in the dissolution medium exists at the solid/liquid interface
c)	Formation of a thin film or layer at the solid-liquid interface
d)	Solute passes easily through the interfaces
62.	Extraction ratio is related to oral availability of drug by following expression:
a)	**F= 1 – ER**

b)	ER= 1- F
c)	F= 100- ER
d)	ER= 100- F
63.	Extent to which drug accumulates relative to first dose is
a)	Accumulation Factor
b)	**Accumulation Index**
c)	Apparent volume of distribution
d)	Drug toxicity
64.	Which of the following is pharmacodynamics method of studying bioavailability
a)	**Acute pharmacologic response**
b)	Plasma-level time studies
c)	Urinary excretion studies
d)	Stool excretion studies
65.	Most abundant abundant plasma protein with large drug binding capacity is
a)	**Human serum albumin (HSA)**
b)	1-Acid Glycoprotein
c)	Orosomucoid
d)	Lipoproteins
66.	Surfactants are used as absorption enhancers at concentration
a)	above critical micelle concentration
b)	**below critical micelle concentration**
c)	critical micelle concentration does not affect
d)	equal to critical micelle concentration
67.	_____ is used to calculate area under the curve
a)	**Trapezoidal rule**
b)	Noyes Whitney's equation

c)	Ficks equation
d)	Method of residual
68.	What is bioavailability
a)	**The rate and extent of absorption of the unchanged drug from its dosage form**
b)	The time of absorption of the drug from its dosage form
c)	The time of absorption of the unchanged drug from its dosage form
d)	The rate of absorption of the drug from its dosage form
69.	In multi compartment model all transfer processes in and out of compartment are assumed to follow
a)	Zero order kinetics
b)	**First order Kinetics**
c)	Second Order Kinetics
d)	Mixed order kinetics
70.	Identify the kinetics- plasma drug concentration versus time plots are directly related to the dose of the drug
a)	**Linear pharmacokinetics**
b)	Non linear pharmacokinetics
c)	Mixed order kinetics
d)	Multiple kinetics
71	Capacity limited kinetics is also called as
a)	Linear Pharmacokinetics
b)	**Non linear pharmacokinetics**
c)	Dose dependent kinetics
d)	First order Kinetics
72	One compartment IV infusion model follows
a)	**Zero order absorption and first order elimination kinetics**
b)	First order absorption and first order elimination kinetics

c)	Zero order absorption and Zero order elimination kinetics
d)	First order absorption and Zero order elimination kinetics
73	In Michaelis- Menton equation When value of Km=C
a)	Rate of process is zero order
b)	Rate of process is first order
c)	**Rate of Process is half the maximum rate**
d)	Rate of process is double the maximum rate
74	Mechanism of drug excretion through skin is
a)	Active secretion
b)	**Passive diffusion**
c)	Passive reabsorption
d)	Glomerular secretion
75	In case of multiple IV injections, the ratio of steady state concentration to initial concentration is called as
a)	**Accumulation factor**
b)	Maxima
c)	Minima
d)	Absorption factor
76	While designing dosage regimen for narrow therapeutic index drug, the preferred method is
a)	**small doses administered at frequent intervals**
b)	larger doses administered at relatively longer intervals
c)	small doses administered at longer interval

d)	administered twice a day
77	_____ organ can be considered in peripheral compartment
a)	Liver
b)	Heart
c)	**Bone**
d)	GIT
78	Dose Dependent pharmacokinetics is also known as
a)	One compartment kinetics, when the dose is administered by IV bolus route
b)	One compartment kinetics, when the dose is administered by IV infusion route
c)	One compartment kinetics, when the dose is administered by oral route
d)	**Non-linear pharmacokinetics**
79	Induction of drug metabolism leads to_____ in half-life of drug
a)	Increase
b)	**Decrease**
c)	Remain constant
d)	Unpredictable
80	Probenecid act as uricosuric agent as it
a)	**competitively inhibit active reabsorption of uric acid**
b)	inhibits glomerular filtration of uric acid
c)	competitively inhibit active secretion of uric acid
d)	has structural similarity with uric acid

81	Drug X has molecular weight of 750 dalton, predict its route of excretion
a)	**biliary excretion**
b)	salivary excretion
c)	renal excretion
d)	Pulmonary excretion
82	The kinetics of capacity-limited or saturable processes is best described by
a)	**Michaelis Menten equation**
b)	Handerson Hasselbalch Equation
c)	Hackle's Equation
d)	Noyes Whitney Equation
83	Enzyme induction is
a)	**The phenomenon of increased drug metabolizing ability of enzymes by drugs and chemicals**
b)	The phenomenon of increasing drug bioavailability by drugs and chemicals
c)	The phenomenon of increasing drug distribution by drugs and chemicals
d)	The phenomenon of increasing drug concentration for a particular tissue by drugs and chemicals
84	Identify the process where structurally same compounds compete for the same site on an enzyme to inhibit that
a)	**Competitive inhibition**
b)	Repression
c)	Non-competitive inhibition
d)	Altered physiology
85	Following are the Phase I reactions except

a)	Oxidative reactions
b)	Reductive reaction
c)	Hydrolytic reaction
d)	**Sulfation reaction**
Q. II	**Descriptive Questions (8marks/ 4marks)**
	Unit 1
1	State different mechanisms of drug transport through GIT. Explain Passive diffusion process.
2	Draw a typical plasma drug concentration- time profile. Label and define all pharmacokinetic and pharmacodynamics parameters.
3	Explain significance of protein binding.
4	Describe the factors influencing protein binding of drugs.
5	Describe transcellular route of drug absorption.
6	What are the advantages of administering drugs by non per os non-invasive transmucosal routes? Name such routes. Discuss the factors in the absorption of drugs from any three routes.
7	Explain the pH Partition Hypothesis in drug absorption in GIT.
8	Explain various physiological barriers to distribution of drugs.
9	Define apparent volume of distribution. Why cannot the volume of distribution of a drug have a true physiologic meaning?
10	Explain Facilitated diffusion as absorption mechanism
11	How does gastric emptying affect absorption of drugs?
12	Explain passive diffusion as a transport mechanism.
13	Write a short note on the role of blood brain barriers in distribution of drugs.
14	Explain effect of any two formulation related/ drug related/ physiological factors affecting drug absorption.
15	Explain barriers for distribution of drugs.
16	Write the limitations of the pH partition hypothesis.

17	Explain the physicochemical factors influencing the distribution of drugs.
	Unit 2
18	Define clearance and renal clearance ratio of a drug. Based on the renal clearance ratio values, how can one estimate the mechanism of renal clearance of a drug?
19	What is BCS Classification of Drugs? Explain the various methods to enhance bioavailability of poorly soluble drugs through enhancement of drug solubility or dissolution rate
20	What are various levels in *in vitro-in vivo* correlations?
21	Explain about different types of official dissolution test apparatuses(USP) and their applications.
22	Compare absolute and relative bioavailability. Enlist various methods for determination of bioavailability and discuss any one.
23	What is the modified Noyes Whitney equation? Explain how the various parameters affect the dissolution of drugs. Explain the Dissolution Apparatus I as per I.P.
24	What are various approaches aimed at enhancing bioavailability of drugs from its dosage form? Explain any four**.**
25	Explain Film theory of dissolution
26	Explain the effect of urine pH and flow rate on drug excretion.
27	State the methods for measurement of bioavailability? Explain any one
28	Explain the factors affecting Renal Excretion of Drug.
29	Write a note on salivary excretion of drugs
30	Write a note on the official IP Type II Dissolution test apparatus.
31	Enlist different routes of non renal clearance. Explain any one.
32	Discuss the effect of distribution and binding characteristics of the drug, drug interactions on renal excretion of drugs.
	Unit 3
33	Describe assumptions, types of compartmental models and compare compartment models with physiological models.

34	After an intravenous bolus injection of 50 mg of a drug following one compartment kinetics. The plasma concentration time profile is represented by $C = 42e^{-0.04t}$ Calculate a) Elimination half-life and AUC zero to infinity b) Volume of distribution and clearance c) Plasma concentration after 5 hours. d) Amount eliminated after 7 hours. e) Time required for elimination of 60% of the dose.
35	Derive equation for one compartment IV bolus administration.
36	Derive equation for one compartment IV infusion administration.
37.	Derive equation for one compartment extravascular administration.
38.	Draw plasma concentration time profile after extravascular administration, explain various phases.
	Unit 4
39.	The loading dose is calculated on the basis of apparent Vd of a drug whereas maintenance dose is determined from its t½. Explain.
40.	Elaborate on fluctuations in plasma concentration of drug after multiple IV bolus injection. Explain the equation used for calculation of maximum and minimum plasma concentration.
41.	Write a note on two compartment open models.
42.	Explain loading dose and maintenance dose.
43.	Why drug accumulate in the body after multiple dosing?
	Unit 5
44.	Define dose-dependent kinetics. What processes of drug absorption and distribution are known to show nonlinearity? Give examples.
45.	What are different causes of non linearity?
46.	Describe absorption processes that may cause non-linearity in pharmacokinetics.

47	Enlist Phase I reactions, Explain any one in detail.
48.	Explain any one Phase II reaction
49.	Write a note on enzyme induction
50.	Describe the characteristics of microsomal enzymes.
51.	Write a note on enzyme Inhibition.
52.	What are the causes of non-linearity in drug metabolism and excretion?
53.	What are the causes of non-linearity? Write Michaelis Menten Equation.
54.	Write a note on Phase II reactions.