GENERAL PHARMACOLOGY

1. All of the following are general mechanisms of drug permeation Except

(a) Aqueous diffusion
(b) Aqueous hydrolysis
(c) Lipid diffusion
(d) Pinocytosis or endocytosis
(e) Special carrier transport

2. If the plasma concentration of a drug declines with "first-order kinetics", this means that

(a) There is only one metabolic path for drug disposition
(b) The half-life is the same regardless of the plasma concentration
(c) The drug is largely metabolized in the liver after oral administration and has low bioavailability elimination
(d) The rate of climination is proportionate to the rate of administration at all times
(e) The drug is not distributed outside the vascular system

3. Regarding termination of drug action

(a) Drug must be exerted from the body to terminate their action
(b) Metabolism of drugs always increases their water solubility
(c) Metabolism of drugs always abolishes their pharmacologic activity
(d) Hepatic metabolism and renal excretion are the two most important mechanisms involved
(e) Distribution of a drug out of the bloodstream terminates the drug's effect

4. Distribution of drugs to specific tissues

(a) Is independent of blood flow to the organ
(b) Is independent of the solubility of the drug in that tissue
(c) Depends on the unbound drug concentration gradient between blood and tissue
(d) Is increased for drugs that are strongly bound to plasma proteins
(e) Has no effect on the half-life of the drug

5. A physical process by which a weak acid becomes less water-soluble and more lipid-soluble at low pH is

(a) Distribution (b) Elimination
(c) First-pass effect (d) Permeation
(e) Protonation

6. Dose-response curves are used for drug evaluation in the animal laboratory and in the clinic, Quantal dose-response curves are often

(a) Used for determining the therapeutic index of a drug
(b) Used for determining the maximal efficacy of a drug
(c) Invalid in the presence of inhibitors of the drug being studied
(d) Obtained from the study of intact subject but not from isolated tissue preparations

(e) Used to determine the statistical variation (standard deviation) of the maximal response to the drug.

7. The following are excreted faster in basic urine

(a) Weak acids (b) Strong acids
(c) Weak Bases (d) None of the above

8. Which of the following statements about spare receptors is most correct ?

(a) Spare receptors, in the absence of drug, are sequestered in the cytoplasm
(b) Spare receptors will be detected if the intracellular effect of drug-receptor interaction lasts longer than the drug-receptor interaction itself
(c) Spare receptors influence the maximal efficacy of the drug-receptor system
(d) Spare receptors activate the effector machinery of the cell without the need for a drug
(e) Spare receptors may be detected by the finding that the EC_{50} is greater than the K_d for the agonist

9. Which of the following terms best describes an antagonist that interacts directly with the agonist and not at all or only incidentally, with the receptor ?

(a) Pharmacological antagonist
(b) Partial agonist
(c) Physiological antagonist
(d) Chemical antagonist
(e) Noncompetitive antagonist

10. Which of the following terms best describes a drug that blocks the action of epinephrine at its receptors by occupying those receptors without activating them ?

(a) Pharmacological antagonist
(b) Partial agonist
(c) Physiological antagonist
(d) Chemical antagonist
(e) Noncompetitive antagonist

11. Which of the following provides information about the variation in sensitivity of the drug within the population studied ?

(a) Maximal efficacy
(b) Therapeutic index
(c) Drug potency
(d) Grade dose-response curve
(e) Quantal dose-response curve

12. Which of the following most accurately describes the transmembrane signaling process involved in steroid hormone action ?

(a) Action on a membrane spanning tyrosine kinase
(b) Activation of a G protein which activates or inhibits adenyl cyclase
(c) Diffusion into the cytoplasm and binding to an intracellular receptor
(d) Diffusion of "STAT" molecules across the membrane
(e) Opening of transmembrane ion channels

13. Which of the following is a phase II drug-metabolizing reaction ?

(a) Acetylation (b) Deamination
(c) Hydrolysis (d) Oxidation
(e) Reduction

14. Which of the following drugs may inhibit the hepatic microsomal P450 responsible for warfarin metabolism

(a) Cimetidine (b) Ethanol
(c) Phenobarbital (d) Procainamide
(e) Rifampin

15. With regard to clinical trials of new drugs, which of the following is most correct ?

(a) Phase I involves the study of a small number of normal volunteers by highly trained clinical pharmacologists
(b) Phase II involves the use of the new drug in a large number of patients (100-5000) who have the disease to be treated
(c) Phase III involves the determination of the drug's therapeutic index by the cautious induction of toxicity
(d) Chemical antagonist
(e) Phase II requires the use of a positive control (a known effective drug) and a placebo

16. Animal testing of potential new therapeutic agents

(a) Extends over a time period of at least 3 years in order to discover late toxicities
(b) Requires the use of at least two primate species, eg. Monkey and baboon
(c) Requires the submission of histopathologic slides and specimens to the FDA for government evaluation
(d) Has good predictability for drug allergy-type reactions
(e) May be abbreviated in the case of some very toxic agents used in cancer

17. The "dominant lethal" test involves the treatment of a male adult animal with a chemical before mating; the pregnant female is later examined for fetal death and abnormalities. The dominant lethal test therefore is a test of

(a) Teratogenicity
(b) Mutagenicity
(c) Carcinogenicity
(d) All of the above
(e) None of the above

18. The Ames test is a method for detecting

(a) Carcinogenesis in rodents
(b) Carcinogenesis in primates
(c) Teratogenesis in any mammalian species
(d) Teratogenesis in primates
(e) Mutagenesis in bacteria

19. "Nicotinic" sites include all of the following except

(a) Bronchial smooth muscle
(b) Adrenal medullary cells
(c) Parasympathetic ganglia
(d) Skeletal muscle
(e) Sympathetic ganglia

20. A good example of chemical antagonism

(a) Heparin & Protamine
(b) Protamine & Zinc
(c) Heparin & Prothrombin
(d) All the above

21. Which of the following agents is a pro-drug that is much less toxic in mammals than in insects ?

(a) Acetylcholine (b) Bethanechol
(c) Physostigmine (d) Pilocarpine
(e) Neostigmine

22. Phenylephrine causes

(a) Constriction of vessels in the nasal mucosa
(b) Increased gastric secretion and motility
(c) Increased skin temperature
(d) Miosis
(e) All of the above

23. Pretreatment with propranolol will block which one of the following ?

(a) Methacholine-induced tachycardia
(b) Nicotine-induced hypertension
(c) Norepinephrine-induced bradycardia
(d) Phenylephrine-induced mydriasis

24. Most drug receptors are

(a) Small molecules with a molecular weight between 100 and 1000
(b) Lipids arranged in a bilayer configuration
(c) Proteins located on cell membranes or in the cytosol
(d) DNA molecules
(e) RNA molecules

25. With regard to distribution of a drug from the blood into tissues

(a) Blood flow to the tissue is an important determinant
(b) Solubility of the drug in the tissue is an important determinant
(c) Concentration of the drug in the blood is an important determinant
(d) Size (volume) of the tissue is an important determinant
(e) All of the above are important determinants

26. The pH value is calculated mathematically as the

(a) Log of the hydroxyl ion (OH^-) concentration
(b) Negative log of the OH^- concentration
(c) Log of the hydrogen ion (H^+) concentration
(d) Negative log of the H^+ concentration
(e) Ratio of H^+/OH^- concentration

27. Which property is classified as colligative?

(a) Solubility of a solute
(b) Osmotic pressure

(c) Hydrogen ion (H^+) concentration
(d) Dissociation of a solute
(e) Miscibility of the liquids

28. The colligative properties of a solution are related to the

(a) pH of the solution
(b) Number of ions in the solution
(c) Total number of solute particles in the solution
(d) Number of unionized molecules in the solution
(e) pKa of the solution

29. The pH of a buffer system can be calculated with the

(a) Noyes – Whitney equation
(b) Henderson – Hasselbalch equation
(c) Michaelis – Menten equation
(d) Yong equation
(e) Stokes equation

30. Which mechanism is most often responsible for chemical degradation?

(a) Racemization (b) Photolysis
(c) Hydrolysis (d) Decarboxylation
(e) Oxidation

31. Which equation is used to predict the stability of a drug product at room temperature from experiments at accelerated temperature?

(a) The stokes equation
(b) The Yong equation
(c) The Arrhenius equation
(d) The Michaelis – Menten equation
(e) The Hixson – Crowell equation

32. Based on the relation between the degree of ionization and the solubility of a weak acid, the drug aspirin (pKa 3.49) will be most soluble at

(a) pH 1.0 (b) pH 2.0
(c) pH 3.0 (d) pH 4.0
(e) pH 6.0

33. The particle size of the dispersed solid in a suspension is usually greater than

(a) 0.5 µm (b) 0.4 µm
(c) 0.3 µm (d) 0.2 µm
(e) 0.1 µm

34. In the extemporaneous preparation of a suspension, levigation is used to

(a) Reduce the zeta potential
(b) Avoid bacterial growth
(c) Reduce particle size
(d) Enhance viscosity
(e) Reduce viscosity

35. Active transport differs from facilitated transport in following ways, except

(a) Carrier is involved
(b) It is against concentration gradient
(c) Energy is required
(d) All of the above

36. Vanishing cream is an ointment that may be classified as

(a) A water –soluble base
(b) An oleaginous base
(c) An absorption base
(d) An emulsion base
(e) An oleic base

37. Rectal suppositories intended for adult use usually weigh approximately

(a) 1g (b) 2g
(c) 3g (d) 4g
(e) 5g

38. In the fusion method of making cocoa butter suppositories,which substance is most likely to be used to lubricate the mold?

(a) Mineral oil (b) Propylene glycol
(c) Cetyl alcohol (d) Stearic acid
(e) Magnesium silicate

39. A very fine powdered chemical is defined as one that

(a) Completely passes through a # 80 sieve
(b) Completely passes through a # 120 sieve
(c) Completely passes through a # 20 sieve
(d) Passes through a # 60 sieve and not more than 40% through a # 100 sieve
(e) Passes through a # 40 sieve and not more than 60% through a # 60 sieve

40. Which technique is typically used to mill camphor?

(a) Trituration
(b) Levigation
(c) Pulverization and intervention
(d) Geometric dilution
(e) Attrition

41. Which type of paper best protects a divided hygroscopic powder?

(a) Waxed paper (b) Glassine
(c) White bond (d) Blue bond
(e) Vegetable parchment

42. Which capsule size has the smallest capacity?

(a) 5 (b) 4
(c) 1 (d) 0
(e) 000

43. The shells of soft gelatin capsules may be made elastic or plastic–like by the addition of

(a) Sorbitol
(b) Povidone
(c) Polyethylene glycol
(d) Lactose
(e) pKa of the solution

44. Nonionic surface-active agents used as synthetic emulsifiers include

(a) Tragacanth
(b) Sodium lauryl sulphate
(c) Sorbitan esters(spans)

45. A ceramic mortar may be preferable to a glass mortar when

(a) A volatile oil is added to a powder mixture
(b) Colored substances (dyes) are mixed into a powder
(c) Comminution is desired in addition to mixing

46. Divided powders may be dispensed in

(a) Individual-dose packets
(b) A bulk container
(c) A perforated, sifter –type container

47. Agents that may be used to coat enteric coated tablets include

(a) Hydroxypropyl methyl cellulose
(b) Carboxymethyl cellulose
(c) Cellulose acetate phthalate

48. For each tablet processing problem listed below, select the most likely reason for the condition

(a) Excessive moisture in the granulation (1) Picking
(b) Entrapment of air (2) Mottling
(c) Tablet friability (3) Capping
(d) Degraded drug (4) Sticking
(e) Tablet hardness

49. For each description of a comminution procedure below, select the process that it best describes

(a) Trituration
(b) Spatulation
(c) Levigation
(d) Pulverization by intervention
(e) Tumbling

(1) Rubbing or grinding a substance in a mortar that has a rough inner surface
(2) Reducing and subdividing a substance by adding an easily removable solvent
(3) adding a suitable agent to form a paste and then rubbing or grinding the paste in mortar

50. Match the drug product below with the type of controlled-release dosage form that it represents

(a) Matrix device (1) Biphenamine Capsules
(b) Ion-exchange resin complex (2) Thorazine Spansule Capsules
(c) Hydrocolloid system (3) Valrelease
(d) Osmotic system (4) Slow - K
(e) Coated granules

51. The route of drug administration that gives the most rapid onset of the pharmacological effect is

(a) Intramuscular injection
(b) Intravenous injection
(c) Intradermal injection

(d) Peroral administration
(e) Subcutaneous injection

52. Acidic drugs mainly bind to plasma

(a) Albumin
(b) á$_1$ – acid glycoprotein
(c) Both (a) and (b)
(d) None of the above

53. After peroral administration, drugs generally are absorbed best from the

(a) Buccal cavity (b) Stomach
(c) Duodenum (d) Ileum
(e) Rectum

54. The passage of drug molecules from a region of high drug concentration to a region of low drug concentration is known as

(a) Active transport (b) Bioavailability
(c) Biopharmaceutics (d) Simple diffusion
(e) Pinocytosis

55. What equation describes the rate of drug dissolution from a tablet?

(a) Fick's law
(b) Henderson – Hasselbach equation
(c) Law of mass action
(d) Michaelis – Menten equation
(e) Noyes Whitney equation

56. Dose dumping is a problem in the formulation of

(a) Compressed tablets
(b) Modified- release drug products
(c) Hard gelatin capsules
(d) Soft gelatin capsules
(e) Suppositories

57. The rate of drug bioavailability is most rapid when the drug is formulated as a

(a) Controlled – release product
(b) Hard gelatin capsule
(c) Compressed tablet (d) Solution
(e) Suspension

58. Creatinine clearance is used as a measurement of

(a) Renal excretion rate
(b) Glomerular filtration rate (GFR)
(c) Active renal secretion
(d) Passive renal absorption
(e) Drug metabolism rate

59. The earliest evidence that a drug is stored in tissue is

(a) An increase in plasma protein binding
(b) A large apparent volume of distribution (V_D)
(c) A decrease in the rate of formation of metabolites by the liver
(d) An increase in the number of side effects produced by the drug
(e) A decrease in the amount of free drug excreted in the urine

60. The intensity of the pharmacologic action of a drug is most dependent on the

(a) Concentration of the drug at the receptor site
(b) Elimination half-life ($t_{½}$) of the drug
(c) Onset time of the drug after oral administration
(d) Minimum toxic concentration (MTC) of the drug in plasma
(e) Minimum effective concentration (MEC) of the drug in the body

61. Drug that show nonlinear pharmacokinetics have which property?

(a) A constant ratio of drug metabolites is formed as the administered dose increases
(b) The elimination half-life ($t_{½}$) increases as the administered dose increases
(c) The area under the plasma drug concentration versus time curve (AUC) increases in direct proportion to an increase in the administered dose
(d) Both low and high doses follow first-order elimination kinetics
(e) The steady-state drug concentration increases in direct proportion to the dosing rate

62. The loading dose (D_L) of a drug is usually based on the

(a) Total body clearance (Cl_T) of the drug
(b) Percentage of drug bound to plasma proteins

(c) Fraction of drug excreted unchanged in the urine
(d) Apparent volume of distribution (V_D) and desired drug concentration in plasma
(e) Area under the plasma drug concentration versus time curve (AUC)

63. The renal clearance of insulin is used as a measurement of

(a) Effective renal blood flow
(b) Rate of renal drug excretion
(c) Intrinsic enzyme activity
(d) Active renal secretion
(e) Glomerular filtration rate (GFR)

64. All of the following statements about plasma protein binding of a drug are true except

(a) Displacement of a drug from plasma protein binding sites results in a transient increased volume of distribution (V_D)
(b) Displacement of a drug from plasma protein binding sites makes more free drug available for glomerular filtration
(c) Displacement of a potent drug that is normally more than 95% bound may cause toxicity
(d) Albumin is the major protein involved in protein binding of drugs
(e) Drugs that are highly bound to plasma proteins generally have a greater V_D compared with drugs that are highly bound to tissue proteins

65. _____ is expressed in both the intestinal epithelium and the kidney.

(a) CYP2D6 (b) CYP1A1/2
(c) CYP3A4 (d) CYP2E1

66. The initial distribution of a drug into tissue is determined chiefly by the

(a) Rate of blood flow to tissue
(b) Glomerular filtration rate (GFR)
(c) Stomach emptying time
(d) Affinity of the drug for tissue
(e) Plasma protein binding of the drug

67. Which tissue has the greatest capacity to bio-transform drugs?

(a) Brain (b) Kidney
(c) Liver (d) Lung
(e) Skin

68. The principle of superposition in designing multiple-dose regimens assumes that

(a) Each dose affects the next subsequent dose causing nonlinear elimination
(b) Each dose of drug is eliminated by zero-order elimination
(c) Steady-state plasma drug concentration are reached at approximately 10 half-lives
(d) Early doses of drug do not affect subsequent doses
(e) The fraction of drug absorbed is equal to the fraction of drug eliminated

69. Which equation is true for a zero-order reaction rate of drug ?

(a) $dA/dt = - k$ (b) $t_{½} = 0.693/k$
(c) $A = A_0 e^{-kt}$

70. Which of the following functional groups is most susceptible to hydrolysis ?

(a) R – CO – R (b) R – COOR
(c) R – O - R (d) R – NH- CH_3
(e) R – COOH

71. Monomer units of proteins are known as

(a) Monosaccharides (b) Prosthetic groups
(c) Amino acids (d) Purines
(e) Nucleosides

72. Glucose is a carbohydrate that cannot be hydrolyzed into a simpler substance. It is best described as

(a) A sugar (b) A monosaccharide
(c) A disaccharide (d) A polysaccharide
(e) An oligosaccharide

73. All of the following carbohydrates are considered to be polysaccharides except

(a) Heparin (b) Starch
(c) Glycogen (d) Maltose
(e) Cellulose

74. Which of the following compounds are considered the building blocks of nucleic acids ?

(a) Nucleotides (b) Nucleosides
(c) Monosaccharides (d) Purines
(e) Amino acids

75. Which of the following terms best describes a co-factor that is firmly bound to an apoenzyme?

(a) Holoenzyme (b) Prosthetic group
(c) Coenzyme (d) Transferase
(e) Heteropolysaccharide

76. Enzymes that uncouple peptide linkages are best classified as

(a) Hydrolases (b) Ligases
(c) Oxidoreductases (d) Transferases
(e) Isomaerases

77. The sugar that is inherent in the nucleic acids RNA and DNA is

(a) Glucose (b) Sucrose
(c) Ribose (d) Digitoxose
(e) Maltose

78. N-oxidation will be involved with the metabolism of following drugs, except

(a) Dapsone (b) Meperidine
(c) Phenytoin (d) Chlorpheniramine

79. Which of the following statements describes plasmids? They

(a) Are single – stranded DNA molecules
(b) Carry optional gene(s)
(c) Carry genes essential for growth
(d) Are always found in linear form

80. Bacteria that grow at temperatures as high as 55°C are known as

(a) Psychrophiles (b) Thermophiles
(c) Mesophiles (d) Auxotrophs

81. Which of the following organisms can use only molecular oxygen as the final acceptor?

(a) Obligate anaerobes
(b) Facultative anaerobes
(c) Obligate aerobes
(d) Strict anaerobes

82. A declining growth rate occurs during which of the following phases of bacterial cell growth?

(a) Lag phase (b) Exponential phase
(c) Stationary phase (d) Death phase

83. Which class of antibody has the longest serum half-life and opsonizes antigens for phagocytosis through two different pathways?

(a) Immunoglobulin G (IgG)
(b) Immunoglobulin M(IgM)
(c) Immunoglobulin A (IgA)
(d) Immunoglobulin E (IgE)

84. Urticaria that appears rapidly after the ingestion of food usually indicates which type of hypersensitivity reaction?

(a) Type I (b) Type II
(c) Type III (d) Type IV

85. A patient receives long-term, high-dose therapy with a sulfonamide. After approximately 3 weeks of therapy, the patient has a low-grade fever, rash, and muscle and joint pain. Which type of hypersensitivity accounts for these symptoms?

(a) Type I (b) Type II
(c) Type III (d) Type IV

86. $CD4^+$T cells specifically recognize antigens in which form?

(a) Bound to major histocompatibility (MHC) class I molecules on the surface of any body cell
(b) In free, soluble form in extracellular fluids
(c) Bound to MHC class II molecules on the surface of special antigen-presenting cells (APCs)

87. Which of the following statements concerning a drug receptor is true?

(a) It mediates the nonspecific action of volatile anesthetics
(b) Its expression is induced only by exogenously added drugs
(c) It can bind endogenous ligand to produce physiological activity
(d) It mediates the cathartic activity of magnesium citrate
(e) Down-regulation of receptor level can lead to sensitization of the target cell to the receptor agonist.

88. Which of the following acids has the highest degree of ionization in an aqueous solution?

(a) Aspirin $pK_a = 3.5$
(b) Indomethacin $pK_a = 4.5$
(c) Warfarin $pK_a = 5.1$
(d) Ibuprofen $pK_a = 5.2$
(e) Phenobarbital $pK_a = 7.4$

89. Which of the following salts forms an aqueous solution that is alkaline to litmus?

(a) Sodium chloride
(b) Benzalkonium chloride
(c) Meperidine hydrochloride
(d) Cefazolin sodium
(e) Chlordiazepoxide hydrochloride

90. Hydrolysis reaction are involved with the metabolism of following drugs, except

(a) Procaine (b) Diazepam
(c) Aspirin (d) Lidocaine

91. Flurazepam has pKa of 8.2. What percentage of flurazepam will be ionized at a urine pH of 5.2?

(a) 0.1% (b) 1%
(c) 50% (d) 99%
(e) 99.9%

92. Precipitation may occur when mixing aqueous solutions of meperidine hydrochloride with which of the following solutions?

(a) Sodium bicarbonate injection
(b) Atropine sulfate injection
(c) Sodium chloride injection

93. The excretion of a weakly acidic drug generally is more rapid in alkaline urine than in acidic urine. This process occurs because

(a) A weak acid in alkaline media will exist primarily in its ionized form, which cannot be reabsorbed easily
(b) A weak acid in alkaline media will exist in its lipophilic form, which cannot be reabsorbed easily.
(c) All drugs are excreted more rapidly in an alkaline urine.

94. Which of the following drugs is considered to be the agent of choice for anaphylactic reactions?

(a) Edrophonium (b) Ipratropium
(c) Ambenonium (d) Propantheline
(e) Homatropine

95. Which of the following drugs is considred to be the agent of choice for anaphylactic reactions?

(a) Clonidine (b) Isoproterenol
(c) Epinephrine (d) Phenylephrine
(e) Terbutaline

96. Which of the following emissions from the decay of radionuclides is most commonly used in nuclear medicine imaging?

(a) X-ray (b) Beta
(c) Alpha (d) Gamma
(e) Positron

97. Which of the following radionuclides is mot commonly used in nuclear pharmacy practice?

(a) ^{67}GA (b) ^{201}Tl
(c) ^{99m}TC (d) ^{123}I
(e) ^{133}Xe

98. Which of the following radionuclides is generator produced?

(a) ^{99m}TC (b) ^{201}Tl
(c) ^{67}GA (d) ^{133}Xe
(e) ^{123}I

99. Abrasives, ingredients in dentifrices, are noted for which of the following actions?

(a) Providing flavor
(b) Cleansing via a foaming detergent action
(c) Removing plaque and debris
(d) Preventing dental caries
(e) Adding thickness to the product

100. The appropriate pH range for ophthalmic products is

(a) 2.0 – 3.0 (b) 4.0 – 6.0
(c) 6.0 – 8.0 (d) 8.0 – 10.0

ANSWERS

1. b	2. b	3. d	4. c	5. e	6. a
7. a	8. b	9. d	10. a	11. e	12. c
13. a	14. a	15. a	16. a	17. b	18. e
19. a	20. a	21. a	22. a	23. a	24. c
25. e	26. d	27. b	28. c	29. b	30. c
31. c	32. e	33. a	34. c	35. a	36. d
37. b	38. a	39. b	40. c	41. a	42. a
43. a	44. a	45. c	46. a	47. c	

48. 1. a, 2. d, 3. b, 4. a

49. 1. a, 2. d, 3. c

50. 1. b, 2. e, 3. c, 4. a

51. b	52. b	53. c	54. d	55. d	56. b
57. d	58. b	59. b	60. a	61. b	62. d
63. e	64. e	65. c	66. a	67. c	68. d
69. a	70. b	71. c	72. b	73. d	74. a
75. b	76. a	77. c	78. c	79. b	80. b
81. c	82. d	83. a	84. a	85. c	86. c
87. c	88. a	89. d	90. b	91. e	92. a
93. a	94. b	95. c	96. d	97. c	98. a
99. c	100. c				