

(DO NOT OPEN THIS QUESTION BOOKLET BEFORE TIME OR UNTIL YOU
ARE ASKED TO DO SO)

A

SET-X

PHD-EE-November, 2025
Pharmaceutical Sciences

10033

Sr. No.

Time : 1¼ Hours

Max. Marks : 100

Total Questions : 100

Roll No. (in figures) _____ (in words) _____

Name _____ Date of Birth _____

Father's Name _____ Mother's Name _____

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(Signature of the Candidate)

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SEAL

1. In formulating a null hypothesis for a two-arm superiority trial, you decide : "There is no difference in mean survival between Drug X and standard care." What type of hypothesis is this ?
 - (1) Alternative hypothesis
 - (2) Null hypothesis
 - (3) Research hypothesis
 - (4) Working hypothesis
2. The term "cross-over design" implies that :
 - (1) Subjects cross over from control to treatment at midpoint with no wash-out
 - (2) Each subject receives all interventions in a defined sequence with wash-out periods
 - (3) Investigators cross over roles halfway
 - (4) Randomization is not required
3. A drug shows a longer half-life after oral dosing than after IV dosing. What is the most likely reason ?
 - (1) Absorption is slower than elimination
 - (2) Elimination is slower than absorption
 - (3) Drug is highly protein-bound
 - (4) Bioavailability increased
4. The rate-limiting step in oral absorption of BCS class II drug is :
 - (1) Dissolution
 - (2) Permeability
 - (3) Stability
 - (4) Transit time
5. Intrinsic activity = 0 but affinity = high describes :
 - (1) Full agonist
 - (2) Partial agonist
 - (3) Neutral antagonist
 - (4) Inverse agonist

6. In reporting a randomized trial, omission of the allocation concealment mechanism weakens the report because :
- (1) It increases the risk of selection bias
 - (2) It affects external validity
 - (3) It reduces sample size
 - (4) It invalidates ethics approval
7. For a study of non-parametric data from three independent groups, the correct test is :
- (1) One-way ANOVA
 - (2) Kruskal-Wallis test
 - (3) Mann-Whitney U test
 - (4) Paired t-test
8. In a cohort study, researchers follow exposed and unexposed groups forward. This is :
- (1) Experimental design
 - (2) Observational analytical design
 - (3) Case-control design
 - (4) Cross-sectional design
9. EC50 represents :
- (1) Dose at 50% receptor occupancy
 - (2) Dose causing 50% toxicity
 - (3) Concentration at max binding
 - (4) Dose producing 50% max response
10. A xenobiotic bioactivates to a toxic metabolite via :
- (1) Phase III transporters
 - (2) Phase II glucuronidation
 - (3) Phase I CYP450 oxidation
 - (4) Lysosomal degradation
11. In the context of research ethics, the principle of beneficence means :
- (1) Respecting participant's autonomy
 - (2) Ensuring no harm is done
 - (3) Promoting the well-being of participants
 - (4) Guaranteeing financial compensation

12. Under Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA) guidelines, "quarantine" of newly arrived laboratory animals is required to :
- (1) Allow acclimatisation and screening for diseases before use in experiments
 - (2) Increase sample size
 - (3) Randomise animals between groups
 - (4) Reduce cost of housing
13. The Stern-Volmer equation is relevant to :
- (1) UV bathochromic shift
 - (2) Fluorescence quenching
 - (3) IR anharmonicity
 - (4) NMR decoupling
14. Two compounds have the same conjugation length, but Compound A shows a higher λ_{max} than Compound B. Which explanation is most consistent with UV-Vis molecular orbital theory ?
- (1) Compound A has a higher molar absorptivity
 - (2) Compound A has greater HOMO-LUMO energy gap
 - (3) Compound A has electron-donating substituents increasing π -electron delocalization
 - (4) Both compounds absorb identical wavelengths since conjugation is the same
15. GABA primarily exerts effect via :
- (1) Opening Na^+ channels
 - (2) Opening Cl^- channels
 - (3) Blocking Ca^{2+} channels
 - (4) Increasing glutamate transmission
16. In MTT assay, formazan crystals indicate :
- (1) DNA fragmentation
 - (2) Mitochondrial metabolic activity
 - (3) Membrane permeability
 - (4) Necrotic cell presence

17. Toxicokinetics primarily studies :
- (1) Toxic mechanism at receptor
 - (2) Dose-response relationship at toxic range
 - (3) Distribution & elimination at toxic doses
 - (4) Therapeutic window estimation
18. The Beer-Lambert law assumes that the light source used is :
- (1) Polychromatic
 - (2) Perfectly monochromatic
 - (3) Fluorescent
 - (4) Laser only
19. A highly protein-bound drug (>95%) is administered. Which condition most significantly increases free drug fraction ?
- (1) Increased renal clearance
 - (2) Decrease in plasma albumin
 - (3) Increased hepatic blood flow
 - (4) Slower absorption rate
20. The difference between "random error" and "systematic error" is that :
- (1) Random error alters validity, systematic error alters precision
 - (2) Random error alters precision, systematic error alters validity
 - (3) Both only alter precision
 - (4) Both only alter validity
21. Which of the following excipients acts as a wetting agent to improve dissolution of poorly soluble drugs ?
- (1) Microcrystalline cellulose
 - (2) Sodium lauryl sulfate
 - (3) Talc
 - (4) Magnesium stearate

22. A drug follows zero-order elimination. Which statement is *true* ?
- (1) $t^{1/2}$ is constant
 - (2) Elimination rate is constant
 - (3) AUC is not dose-dependent
 - (4) Follows the Michaelis-Menten first-order region
23. Which of the following method can be used to determine the number of bacteria quantitatively ?
- (1) Spread-plate
 - (2) Streak-plate
 - (3) Pour-plate and spread plate
 - (4) Pour plate
24. Which transport mechanism is saturated at therapeutic concentrations ?
- (1) Passive diffusion
 - (2) Filtration
 - (3) Active transport
 - (4) Paracellular transport
25. Acetaminophen toxicity is largely due to :
- (1) Sulfation
 - (2) Glucuronidation
 - (3) Oxidative metabolites via CYP2E1
 - (4) Methylation
26. Rate-limiting step in noradrenaline synthesis :
- (1) Dopamine to noradrenaline via DBH
 - (2) Tyrosine to L-DOPA by tyrosine hydroxylase
 - (3) L-DOPA to dopamine
 - (4) Noradrenaline reuptake
27. Which polymer is not commonly used in transdermal patches ?
- (1) Ethyl cellulose
 - (2) PVA
 - (3) Eudragit RL
 - (4) Starch sodium glycolate

28. Among the following, the base value used in Woodward-Fieser rules for open-chain conjugated dienes is :
(1) 214 nm (2) 253 nm
(3) 217 nm (4) 193 nm
29. Which of the following is a buffer solution ?
(1) $H_2SO_4 + CuSO_4$ (2) $CH_3COOH + CH_3COONH_4$
(3) $NaCl + NaOH$ (4) $CH_3COONa + CH_3COOH$
30. In suspension formulations, flocculating agents are added to :
(1) Increase viscosity (2) Promote controlled particle aggregation
(3) Reduce wettability (4) Improve color
31. Termination of acetylcholine action is mainly via :
(1) Reuptake (2) COMT metabolism
(3) Acetylcholinesterase hydrolysis (4) MAO metabolism
32. A competitive antagonist shifts dose-response curve :
(1) Downward without shift in EC_{50} (2) Rightward with same E_{max}
(3) Leftward with increased E_{max} (4) Downward with increased slope
33. Which receptor exhibits rapid desensitization via phosphorylation and arrestin binding ?
(1) GPCR (2) RTK
(3) Nuclear receptors (4) Ionotropic receptors
34. Histamine H_1 receptors mediate :
(1) Increased gastric acid secretion
(2) Vasoconstriction
(3) Bronchoconstriction & allergic response
(4) CNS sedation only

35. NMDA receptor requires binding of :
(1) Glutamate only (2) Aspartate only
(3) Glutamate + Glycine as co-agonist (4) GABA + Glycine
36. In NMR, the phenomenon responsible for line broadening due to molecular tumbling correlation time is :
(1) Spin-echo decay (2) Bloch-Siegert shift
(3) T_2 relaxation (4) J-coupling
37. In reversed-phase HPLC, retention time increases for compounds with :
(1) Higher polarity (2) Larger ionic radius
(3) Higher charge (4) Lower polarity
38. Primary screening in drug discovery aims to :
(1) Determine toxicity (2) Evaluate PK
(3) Identify active hits (4) Study receptor selectivity
39. A false-positive in cell viability assay can occur due to :
(1) Compounds reducing MTT directly (2) Accurate pipetting
(3) Serum-free media (4) Using fresh medium
40. Which parameter changes MOST at high toxic doses due to saturable metabolism ?
(1) Clearance increases (2) Clearance decreases
(3) Elimination becomes 1st-order (4) Bioavailability decreases
41. The McLafferty rearrangement requires :
(1) Aromatic ring (2) γ -Hydrogen in carbonyl compound
(3) Halogen substitution (4) Presence of nitro-group

42. In chromatography, resolution increases when :
- (1) Plate height increases
 - (2) Mobile phase velocity increases
 - (3) Selectivity factor increases
 - (4) Peak broadening increases
43. An electron impact MS typically produces :
- (1) Protonated molecular ion
 - (2) Radical cation M^+
 - (3) Sodium-adduct peak
 - (4) Doubly charged ions only
44. In screening plant extract for anti-epileptic activity, MES and PTZ models are used to differentiate :
- (1) Hepatoprotective and anti-inflammatory response
 - (2) GABA agonistic vs Na^+ channel blocking potential
 - (3) Analgesic vs Antipyretic effects
 - (4) Peripheral vs Central antispasmodic action
45. Which of the following is *not* part of the research methodology section of a thesis ?
- (1) Study design
 - (2) Data collection methods
 - (3) Literature review summary
 - (4) Statistical analysis plan
46. In MALDI-TOF MS, ionization primarily occurs by :
- (1) Electron bombardment
 - (2) Desorption with matrix and pulsed laser
 - (3) Electrospray nebulization
 - (4) Plasma interaction
47. Capillary GC columns are preferred due to :
- (1) Low theoretical plates
 - (2) High efficiency & minimal sample loading
 - (3) High column diameter
 - (4) Poor peak resolution

48. The Cotton effect is associated with :
- (1) CD spectroscopy optical activity in chiral chromophores
 - (2) Raman active modes
 - (3) Hyperfine splitting in NMR
 - (4) Ion trap MS
49. Which of the following statements best describes a lead compound ?
- (1) A compound that contains the element lead.
 - (2) A compound from the research laboratory that is chosen to go forward for preclinical and clinical trials.
 - (3) A molecule that shows some activity or property of interest and serves as the starting point for the development of a drug.
 - (4) The first compound of a structural class of compounds to reach the market.
50. Which β -lactam antibiotic belongs to carbapenem class ?
- | | |
|-----------------|-----------------|
| (1) Meropenem | (2) Ceftriaxone |
| (3) Amoxicillin | (4) Nafcillin |
51. In ion-exchange chromatography, separation depends on :
- (1) Vapor pressure
 - (2) Ionic charge and affinity to resin
 - (3) Boiling point
 - (4) Molecular rotation
52. The bandwidth of UV -Vis spectrum increases when :
- | | |
|--------------------------|-------------------------------|
| (1) Slit width decreases | (2) Detector noise reduces |
| (3) Slit width increases | (4) Light intensity decreases |

53. The maximum amount of solute dissolved in a given solvent under standard conditions of temperature, pressure, and pH is known as :
- | | |
|------------------------|--------------------------------------|
| (1) Dissolution rate | (2) Intrinsic dissolution |
| (3) Rate limiting step | (4) Absolute or intrinsic solubility |
54. In HPTLC, peak purity of phytoconstituent can be confirmed using :
- | |
|--|
| (1) R _f value comparison only |
| (2) Documentation under UV before and after derivatization |
| (3) Matching retention time with HPLC data |
| (4) Color observation post-spray |
55. Which statement best describes the primary purpose of preformulation studies in dosage form development ?
- | |
|---|
| (1) To determine packaging and labeling requirements. |
| (2) To assess physicochemical properties for rational formulation design. |
| (3) To finalize manufacturing equipment. |
| (4) To study patient acceptability and palatability. |
56. In EI-MS, which functional group most commonly undergoes α -cleavage to generate a highly stabilized oxonium ion fragment ?
- | | |
|---------------------|----------------------|
| (1) Tertiary amines | (2) Carboxylic acids |
| (3) Ketones | (4) Primary alcohols |
57. Which capsule size has the largest capacity ?
- | | |
|---------|-------|
| (1) 000 | (2) 0 |
| (3) 2 | (4) 5 |

58. Which detector is most suitable for detecting thermo-labile phytoconstituents during separation ?
- (1) UV detector in HPLC
 - (2) TCD detector in GC
 - (3) RID detector in HPLC
 - (4) FID in GC
59. Organoleptic evaluation of crude drugs includes :
- (1) Taste, smell, and microscopic examination
 - (2) Taste, color, odor, and appearance
 - (3) Odor, TLC profile, and ash values
 - (4) Color, odor, and refractive index
60. A drug shows pH-dependent hydrolysis. Stabilization can be achieved by :
- (1) pH buffering and acid/base catalysts inhibition
 - (2) Reducing particle size
 - (3) Adding surfactants only
 - (4) Removing plasticizer
61. During film coating, orange-peel effect is primarily due to :
- (1) Excessive spray rate
 - (2) High polymer viscosity and improper atomization
 - (3) Low pan temperature
 - (4) Excess plasticizer

62. Controlled-release tablets rely on Higuchi square-root law which is applicable to :
- (1) Zero-order diffusion
 - (2) Fickian diffusion from a matrix
 - (3) Osmotic pump release
 - (4) Burst release system
63. The separation of racemic mixture into the pure enantiomer is :
- (1) Resolution
 - (2) Racemization
 - (3) Isomerization
 - (4) All of the above
64. Adulteration of wood powder in red chilli powder is identified using
- (1) Morphology
 - (2) Loss on drying
 - (3) Microscopy
 - (4) Titrimetric
65. A drug solution follows zero-order kinetics. Which statement is *correct* ?
- (1) $t_{1/2}$ depends on initial concentration
 - (2) Rate of drug elimination is constant
 - (3) Rate of elimination is proportional to concentration
 - (4) Shelf-life cannot be calculated
66. Chitosan nanoparticles primarily utilize which mechanism for mucosal drug delivery ?
- (1) Mucoadhesion due to cationic charge
 - (2) P-glycoprotein inhibition
 - (3) Receptor-mediated endocytosis
 - (4) Osmotic pressure differences

67. Name of the scientist who gave the term Pharmacognosy :
- | | |
|-------------|-----------------|
| (1) Seydler | (2) Charak |
| (3) Sushrut | (4) Hippocrates |
68. Ash value indicate :
- (1) Presence of silicates, oxalates, phosphates
 - (2) Presence of chemical composition of plant
 - (3) Presence of different cells and tissues
 - (4) Presence of Water
69. Wurster coating system is used for :
- (1) Melt extrusion
 - (2) Bottom-spray fluid-bed coating of pellets
 - (3) Solvent casting membranes
 - (4) Dry granulation
70. Resolution in chromatography is maximized by increasing :
- | | |
|----------------------------------|-------------------------|
| (1) Column length and efficiency | (2) Flow rate |
| (3) Injection volume | (4) Detector wavelength |
71. Osmotic pump systems follow which release mechanism ?
- (1) Zero-order release independent of pH
 - (2) First-order release
 - (3) Erosion-based release
 - (4) Enzyme-controlled release
72. Accelerated stability studies follow ICH guideline :
- | | |
|-------------|---------|
| (1) Q2 | (2) Q3B |
| (3) Q1A(R2) | (4) Q5C |

73. Drop-outs in a clinical trial most affect which statistical concern ?
- (1) Increase Type I error only
 - (2) Decrease power and risk attrition bias
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74. Which of the following is a key requirement of the Declaration of Helsinki regarding vulnerable populations ?
- (1) They can be enrolled only if the research is responsive to their health needs and cannot be carried out with non-vulnerable populations
 - (2) They should be excluded in all cases
 - (3) They require no additional safeguards
 - (4) They can be recruited without consent
75. Serotonin Precursor :
- (1) Tyrosine
 - (2) Tryptophan
 - (3) Glutamine
 - (4) Glycine
76. A researcher proposes human challenge studies for a vaccine. According to ethical guidelines (Declaration of Helsinki + ICMR), which conditions are essential ?
- (1) Robust scientific justification, minimized risks, independent ethical review, thorough informed consent with comprehension checks, and enhanced clinical care and insurance provisions
 - (2) Only fast recruitment
 - (3) No need for ethics committee if approved by PI
 - (4) Only community consent required

77. PEGylation of nanoparticles improves :
- (1) Cell permeability only
 - (2) Reticuloendothelial clearance & circulation time
 - (3) Crystallinity
 - (4) Hydrolysis rate
78. In sterile manufacturing, Laminar Air Flow (LAF) HEPA filters typically remove particles :
- | | |
|-----------------------|---------------------|
| (1) 0.1 μm | (2) 3 μm |
| (3) 0.5 μm | (4) 5 μm |
79. Which scenario best illustrates "conflict of interest" that must be declared in a trial publication ?
- (1) Principal investigator holds equity in the company manufacturing the investigational drug
 - (2) Investigator received travel reimbursement to a conference 5 years ago unrelated to current trial
 - (3) Investigator uses university email
 - (4) Investigator collaborates with another academic
80. In accelerated stability testing, a liquid oral formulation shows increased precipitation of the active drug over time. Which adjustment would most appropriately enhance physical stability without altering the chemical stability profile ?
- (1) Increase buffer concentration to maintain constant pH
 - (2) Add a suitable cosolvent such as propylene glycol
 - (3) Replace antioxidant with a stronger one
 - (4) Increase storage temperature to improve solubility

81. BHT and BHA are used in dosage forms as :

- (1) Preservatives
- (2) Antioxidants
- (3) Emulsifying agents
- (4) Chelators

82. Which intermolecular force is strongest ?

- (1) Vander Waals
- (2) Dipole-dipole
- (3) Hydrogen bonding
- (4) London dispersion

83. Indicate the *correct* sequence of steps in rational drug design :

- (1) Hit identification → Target validation → Optimization → Lead identification
- (2) Target identification → Validation → Lead identification → Optimization
- (3) Optimization → Lead identification → Target validation → Screening
- (4) Random screening → Optimization → Target identification

84. Science of collecting, monitoring, researching, assessing and evaluating information from healthcare providers and patients on the adverse effects of medications is known as :

- (1) Clinical Trials
- (2) Observational study
- (3) Qualitative study
- (4) Pharmacovigilance

85. Which of the following is a **correct** statement regarding Type I and Type II errors in hypothesis testing ?
- (1) Type I error is the risk of rejecting the null when it is true; Type II error is failing to reject the null when it is false.
 - (2) Type I error is failing to reject the null when it is false; Type II error is rejecting the null when it is true.
 - (3) They are the same if you set $\alpha = \beta$.
 - (4) Only Type I error matters in superiority clinical trials.
86. In which algorithm does AutoDock perform its docking search ?
- (1) Simulated Annealing
 - (2) Lamarckian Genetic Algorithm
 - (3) Monte Carlo Algorithm
 - (4) Particle Swarm Optimization
87. In QSAR, sterimol parameters represent :
- (1) Lipophilicity
 - (2) Steric bulk
 - (3) H-bonding ability
 - (4) Electronic constant
88. Which one of the following drugs does NOT act through G-Protein coupled receptors ?
- | | |
|-----------------|-------------|
| (1) Epinephrine | (2) Insulin |
| (3) Dopamine | (4) TSH |
89. Which one of the following is a flocculating agent for a negatively charged drug ?
- | | |
|------------------------|------------------------|
| (1) Aluminium chloride | (2) Bentonite |
| (3) Tragacanth | (4) Sodium biphosphate |

90. Coulter counter is used in determination of :
- (1) Particle surface area
 - (2) Particle size
 - (3) Particle volume
 - (4) All of the above
91. Which is an irreversible MAO inhibitor ?
- (1) Fluoxetine
 - (2) Selegiline
 - (3) Moclobemide
 - (4) Diazepam
92. Which step is Phase-I metabolism ?
- (1) Oxidation
 - (2) Glucuronidation
 - (3) Sulfation
 - (4) Glutathione conjugation
93. Sulfonamides act as :
- (1) DHFR inhibitors
 - (2) PABA analogs blocking folate synthesis
 - (3) Cell wall synthesis inhibitors
 - (4) RNA polymerase inhibitors
94. Which general anesthetic works by NMDA receptor inhibition ?
- (1) Halothane
 - (2) Isoflurane
 - (3) Ketamine
 - (4) Propofol

95. In sample size calculation, which factor does not directly influence the required number of participants ?
- (1) Desired power (e.g., 80%)
 - (2) Significance level (α)
 - (3) Expected effect size
 - (4) Colour of the data collection forms
96. Which parameter in QSAR indicates hydrophobic contribution ?
- (1) σ
 - (2) π
 - (3) Taft constant
 - (4) LUMO energy
97. Which is **true** about enantiomers in biological systems ?
- (1) Always have identical pharmacological activity
 - (2) Always differ in receptor binding
 - (3) May show different metabolism and toxicity profiles
 - (4) Never interconverts in biological conditions
98. Which antibiotic causes ototoxicity & nephrotoxicity ?
- (1) Penicillin G
 - (2) Gentamicin
 - (3) Erythromycin
 - (4) Doxycycline
99. Which anti-HIV drug is integrase inhibitor ?
- (1) Zidovudine
 - (2) Efavirenz
 - (3) Raltegravir
 - (4) Ritonavir

100. A prodrug concept is used for :

- (1) Increasing polarity always
- (2) Modifying absorption, targeting & reducing toxicity
- (3) Enhancing shelf-life only
- (4) Eliminating metabolism completely

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SEAL

1. Osmotic pump systems follow which release mechanism ?
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 - (3) Investigator uses university email
 - (4) Investigator collaborates with another academic

10. In accelerated stability testing, a liquid oral formulation shows increased precipitation of the active drug over time. Which adjustment would most appropriately enhance physical stability without altering the chemical stability profile ?
- (1) Increase buffer concentration to maintain constant pH
 - (2) Add a suitable cosolvent such as propylene glycol
 - (3) Replace antioxidant with a stronger one
 - (4) Increase storage temperature to improve solubility
11. In ion-exchange chromatography, separation depends on :
- (1) Vapor pressure
 - (2) Ionic charge and affinity to resin
 - (3) Boiling point
 - (4) Molecular rotation
12. The bandwidth of UV -Vis spectrum increases when :
- (1) Slit width decreases
 - (2) Detector noise reduces
 - (3) Slit width increases
 - (4) Light intensity decreases
13. The maximum amount of solute dissolved in a given solvent under standard conditions of temperature, pressure, and pH is known as :
- (1) Dissolution rate
 - (2) Intrinsic dissolution
 - (3) Rate limiting step
 - (4) Absolute or intrinsic solubility
14. In HPTLC, peak purity of phytoconstituent can be confirmed using :
- (1) R_f value comparison only
 - (2) Documentation under UV before and after derivatization
 - (3) Matching retention time with HPLC data
 - (4) Color observation post-spray

15. Which statement best describes the primary purpose of preformulation studies in dosage form development ?
- (1) To determine packaging and labeling requirements.
 - (2) To assess physicochemical properties for rational formulation design.
 - (3) To finalize manufacturing equipment.
 - (4) To study patient acceptability and palatability.
16. In EI-MS, which functional group most commonly undergoes α -cleavage to generate a highly stabilized oxonium ion fragment ?
- (1) Tertiary amines
 - (2) Carboxylic acids
 - (3) Ketones
 - (4) Primary alcohols
17. Which capsule size has the largest capacity ?
- (1) 000
 - (2) 0
 - (3) 2
 - (4) 5
18. Which detector is most suitable for detecting thermo-labile phytoconstituents during separation ?
- (1) UV detector in HPLC
 - (2) TCD detector in GC
 - (3) RID detector in HPLC
 - (4) FID in GC
19. Organoleptic evaluation of crude drugs includes :
- (1) Taste, smell, and microscopic examination
 - (2) Taste, color, odor, and appearance
 - (3) Odor, TLC profile, and ash values
 - (4) Color, odor, and refractive index

20. A drug shows pH-dependent hydrolysis. Stabilization can be achieved by :
- (1) pH buffering and acid/base catalysts inhibition
 - (2) Reducing particle size
 - (3) Adding surfactants only
 - (4) Removing plasticizer
21. Termination of acetylcholine action is mainly via :
- (1) Reuptake
 - (2) COMT metabolism
 - (3) Acetylcholinesterase hydrolysis
 - (4) MAO metabolism
22. A competitive antagonist shifts dose-response curve :
- (1) Downward without shift in EC₅₀
 - (2) Rightward with same E_{max}
 - (3) Leftward with increased E_{max}
 - (4) Downward with increased slope
23. Which receptor exhibits rapid desensitization via phosphorylation and arrestin binding ?
- (1) GPCR
 - (2) RTK
 - (3) Nuclear receptors
 - (4) Ionotropic receptors
24. Histamine H₁ receptors mediate :
- (1) Increased gastric acid secretion
 - (2) Vasoconstriction
 - (3) Bronchoconstriction & allergic response
 - (4) CNS sedation only
25. NMDA receptor requires binding of :
- (1) Glutamate only
 - (2) Aspartate only
 - (3) Glutamate + Glycine as co-agonist
 - (4) GABA + Glycine

26. In NMR, the phenomenon responsible for line broadening due to molecular tumbling correlation time is :
- (1) Spin-echo decay
 - (2) Bloch-Siegert shift
 - (3) T_2 relaxation
 - (4) J-coupling
27. In reversed-phase HPLC, retention time increases for compounds with :
- (1) Higher polarity
 - (2) Larger ionic radius
 - (3) Higher charge
 - (4) Lower polarity
28. Primary screening in drug discovery aims to :
- (1) Determine toxicity
 - (2) Evaluate PK
 - (3) Identify active hits
 - (4) Study receptor selectivity
29. A false-positive in cell viability assay can occur due to :
- (1) Compounds reducing MTT directly
 - (2) Accurate pipetting
 - (3) Serum-free media
 - (4) Using fresh medium
30. Which parameter changes MOST at high toxic doses due to saturable metabolism ?
- (1) Clearance increases
 - (2) Clearance decreases
 - (3) Elimination becomes 1st-order
 - (4) Bioavailability decreases
31. In the context of research ethics, the principle of beneficence means :
- (1) Respecting participant's autonomy
 - (2) Ensuring no harm is done
 - (3) Promoting the well-being of participants
 - (4) Guaranteeing financial compensation

32. Under Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA) guidelines, "quarantine" of newly arrived laboratory animals is required to :
- (1) Allow acclimatisation and screening for diseases before use in experiments
 - (2) Increase sample size
 - (3) Randomise animals between groups
 - (4) Reduce cost of housing
33. The Stern-Volmer equation is relevant to :
- (1) UV bathochromic shift
 - (2) Fluorescence quenching
 - (3) IR anharmonicity
 - (4) NMR decoupling
34. Two compounds have the same conjugation length, but Compound A shows a higher λ_{max} than Compound B. Which explanation is most consistent with UV-Vis molecular orbital theory ?
- (1) Compound A has a higher molar absorptivity
 - (2) Compound A has greater HOMO-LUMO energy gap
 - (3) Compound A has electron-donating substituents increasing π -electron delocalization
 - (4) Both compounds absorb identical wavelengths since conjugation is the same
35. GABA primarily exerts effect via :
- (1) Opening Na^+ channels
 - (2) Opening Cl^- channels
 - (3) Blocking Ca^{2+} channels
 - (4) Increasing glutamate transmission
36. In MTT assay, formazan crystals indicate :
- (1) DNA fragmentation
 - (2) Mitochondrial metabolic activity
 - (3) Membrane permeability
 - (4) Necrotic cell presence

37. Toxicokinetics primarily studies :
- (1) Toxic mechanism at receptor
 - (2) Dose-response relationship at toxic range
 - (3) Distribution & elimination at toxic doses
 - (4) Therapeutic window estimation
38. The Beer-Lambert law assumes that the light source used is :
- (1) Polychromatic
 - (2) Perfectly monochromatic
 - (3) Fluorescent
 - (4) Laser only
39. A highly protein-bound drug (>95%) is administered. Which condition most significantly increases free drug fraction ?
- (1) Increased renal clearance
 - (2) Decrease in plasma albumin
 - (3) Increased hepatic blood flow
 - (4) Slower absorption rate
40. The difference between "random error" and "systematic error" is that :
- (1) Random error alters validity, systematic error alters precision
 - (2) Random error alters precision, systematic error alters validity
 - (3) Both only alter precision
 - (4) Both only alter validity
41. Which is an irreversible MAO inhibitor ?
- (1) Fluoxetine
 - (2) Selegiline
 - (3) Moclobemide
 - (4) Diazepam
42. Which step is Phase-I metabolism ?
- (1) Oxidation
 - (2) Glucuronidation
 - (3) Sulfation
 - (4) Glutathione conjugation

43. Sulfonamides act as :
- (1) DHFR inhibitors
 - (2) PABA analogs blocking folate synthesis
 - (3) Cell wall synthesis inhibitors
 - (4) RNA polymerase inhibitors
44. Which general anesthetic works by NMDA receptor inhibition ?
- (1) Halothane
 - (2) Isoflurane
 - (3) Ketamine
 - (4) Propofol
45. In sample size calculation, which factor does not directly influence the required number of participants ?
- (1) Desired power (e.g., 80%)
 - (2) Significance level (α)
 - (3) Expected effect size
 - (4) Colour of the data collection forms
46. Which parameter in QSAR indicates hydrophobic contribution ?
- (1) σ
 - (2) π
 - (3) Taft constant
 - (4) LUMO energy
47. Which is *true* about enantiomers in biological systems ?
- (1) Always have identical pharmacological activity
 - (2) Always differ in receptor binding
 - (3) May show different metabolism and toxicity profiles
 - (4) Never interconverts in biological conditions

48. Which antibiotic causes ototoxicity & nephrotoxicity ?
- | | |
|------------------|-----------------|
| (1) Penicillin G | (2) Gentamicin |
| (3) Erythromycin | (4) Doxycycline |
49. Which anti-HIV drug is integrase inhibitor ?
- | | |
|-----------------|---------------|
| (1) Zidovudine | (2) Efavirenz |
| (3) Raltegravir | (4) Ritonavir |
50. A prodrug concept is used for :
- (1) Increasing polarity always
 - (2) Modifying absorption, targeting & reducing toxicity
 - (3) Enhancing shelf-life only
 - (4) Eliminating metabolism completely
51. During film coating, orange-peel effect is primarily due to :
- (1) Excessive spray rate
 - (2) High polymer viscosity and improper atomization
 - (3) Low pan temperature
 - (4) Excess plasticizer
52. Controlled-release tablets rely on Higuchi square-root law which is applicable to :
- (1) Zero-order diffusion
 - (2) Fickian diffusion from a matrix
 - (3) Osmotic pump release
 - (4) Burst release system

53. The separation of racemic mixture into the pure enantiomer is :
- (1) Resolution
 - (2) Racemization
 - (3) Isomerization
 - (4) All of the above
54. Adulteration of wood powder in red chilli powder is identified using
- (1) Morphology
 - (2) Loss on drying
 - (3) Microscopy
 - (4) Titrimetric
55. A drug solution follows zero-order kinetics. Which statement is *correct* ?
- (1) $t_{1/2}$ depends on initial concentration
 - (2) Rate of drug elimination is constant
 - (3) Rate of elimination is proportional to concentration
 - (4) Shelf-life cannot be calculated
56. Chitosan nanoparticles primarily utilize which mechanism for mucosal drug delivery ?
- (1) Mucoadhesion due to cationic charge
 - (2) P-glycoprotein inhibition
 - (3) Receptor-mediated endocytosis
 - (4) Osmotic pressure differences
57. Name of the scientist who gave the term Pharmacognosy :
- (1) Seydler
 - (2) Charak
 - (3) Sushrut
 - (4) Hippocrates

58. Ash value indicate :
- (1) Presence of silicates, oxalates, phosphates
 - (2) Presence of chemical composition of plant
 - (3) Presence of different cells and tissues
 - (4) Presence of Water
59. Wurster coating system is used for :
- (1) Melt extrusion
 - (2) Bottom-spray fluid-bed coating of pellets
 - (3) Solvent casting membranes
 - (4) Dry granulation
60. Resolution in chromatography is maximized by increasing :
- (1) Column length and efficiency
 - (2) Flow rate
 - (3) Injection volume
 - (4) Detector wavelength
61. BHT and BHA are used in dosage forms as :
- (1) Preservatives
 - (2) Antioxidants
 - (3) Emulsifying agents
 - (4) Chelators
62. Which intermolecular force is strongest ?
- (1) Vander Waals
 - (2) Dipole-dipole
 - (3) Hydrogen bonding
 - (4) London dispersion

63. Indicate the **correct** sequence of steps in rational drug design :
- (1) Hit identification → Target validation → Optimization → Lead identification
 - (2) Target identification → Validation → Lead identification → Optimization
 - (3) Optimization → Lead identification → Target validation → Screening
 - (4) Random screening → Optimization → Target identification
64. Science of collecting, monitoring, researching, assessing and evaluating information from healthcare providers and patients on the adverse effects of medications is known as :
- (1) Clinical Trials
 - (2) Observational study
 - (3) Qualitative study
 - (4) Pharmacovigilance
65. Which of the following is a **correct** statement regarding Type I and Type II errors in hypothesis testing ?
- (1) Type I error is the risk of rejecting the null when it is true; Type II error is failing to reject the null when it is false.
 - (2) Type I error is failing to reject the null when it is false; Type II error is rejecting the null when it is true.
 - (3) They are the same if you set $\alpha = \beta$.
 - (4) Only Type I error matters in superiority clinical trials.
66. In which algorithm does AutoDock perform its docking search ?
- (1) Simulated Annealing
 - (2) Lamarckian Genetic Algorithm
 - (3) Monte Carlo Algorithm
 - (4) Particle Swarm Optimization

67. In QSAR, sterimol parameters represent :
- (1) Lipophilicity
 - (2) Steric bulk
 - (3) H-bonding ability
 - (4) Electronic constant
68. Which one of the following drugs does NOT act through G-Protein coupled receptors ?
- (1) Epinephrine
 - (2) Insulin
 - (3) Dopamine
 - (4) TSH
69. Which one of the following is a flocculating agent for a negatively charged drug ?
- (1) Aluminium chloride
 - (2) Bentonite
 - (3) Tragacanth
 - (4) Sodium biphosphate
70. Coulter counter is used in determination of :
- (1) Particle surface area
 - (2) Particle size
 - (3) Particle volume
 - (4) All of the above
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- (1) Aromatic ring
 - (2) γ -Hydrogen in carbonyl compound
 - (3) Halogen substitution
 - (4) Presence of nitro-group
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 - (4) Cross-sectional design
99. EC₅₀ represents :
- (1) Dose at 50% receptor occupancy
 - (2) Dose causing 50% toxicity
 - (3) Concentration at max binding
 - (4) Dose producing 50% max response

100. A xenobiotic bioactivates to a toxic metabolite via :

- | | |
|------------------------------|------------------------------|
| (1) Phase III transporters | (2) Phase II glucuronidation |
| (3) Phase I CYP450 oxidation | (4) Lysosomal degradation |

(DO NOT OPEN THIS QUESTION BOOKLET BEFORE TIME OR UNTIL YOU
ARE ASKED TO DO SO)

C

PHD-EE-November, 2025
Pharmaceutical Sciences

SET-X

10043

Sr. No.

Time : 1½ Hours

Max. Marks : 100

Total Questions : 100

Roll No. (in figures) _____ (in words) _____

Name _____ Date of Birth _____

Father's Name _____ Mother's Name _____

Date of Examination _____

(Signature of the Candidate)

(Signature of the Invigilator)

**CANDIDATES MUST READ THE FOLLOWING INFORMATION/INSTRUCTIONS BEFORE
STARTING THE QUESTION PAPER.**

1. **All questions are compulsory.**
2. The candidates **must return** the question booklet as well as OMR Answer-Sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means / mis-behaviour will be registered against him / her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.
3. Keeping in view the transparency of the examination system, carbonless OMR Sheet is provided to the candidate so that a copy of OMR Sheet may be kept by the candidate.
4. Question Booklet along with answer key of all the A, B, C & D code shall be got uploaded on the University Website immediately after the conduct of Entrance Examination. Candidates may raise valid objection/complaint if any, with regard to discrepancy in the question booklet/answer key within 24 hours of uploading the same on the University Website. The complaint be sent by the students to the Controller of Examinations by hand or through email. Thereafter, no complaint in any case, will be considered.
5. The candidate **must not** do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the question booklet itself. Answers **must not** be ticked in the question booklet.
6. **There will be negative marking and a deduction of 0.25 marks for each wrong answer. Each correct answer will be awarded one full mark. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.**
7. Use only **Black or Blue Ball Point Pen** of good quality in the OMR Answer-Sheet.
8. **Before answering the questions, the candidates should ensure that they have been supplied correct and complete booklet. Complaints, if any, regarding misprinting etc. will not be entertained 30 minutes after starting of the examination.**

PHD-EE-November, 2025/(Pharmaceutical Sciences)(SET-X)/(C)

SEAL

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- (3) Concentration at max binding
- (4) Dose producing 50% max response

30. A xenobiotic bioactivates to a toxic metabolite via :

- (1) Phase III transporters
- (2) Phase II glucuronidation
- (3) Phase I CYP450 oxidation
- (4) Lysosomal degradation

31. Which is an irreversible MAO inhibitor ?

- (1) Fluoxetine
- (2) Selegiline
- (3) Moclobemide
- (4) Diazepam

32. Which step is Phase-I metabolism ?

- (1) Oxidation
- (2) Glucuronidation
- (3) Sulfation
- (4) Glutathione conjugation

33. Sulfonamides act as :

- (1) DHFR inhibitors
- (2) PABA analogs blocking folate synthesis
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34. Which general anesthetic works by NMDA receptor inhibition ?
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- (1) Increasing polarity always
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41. During film coating, orange-peel effect is primarily due to :
- (1) Excessive spray rate
 - (2) High polymer viscosity and improper atomization
 - (3) Low pan temperature
 - (4) Excess plasticizer
42. Controlled-release tablets rely on Higuchi square-root law which is applicable to :
- (1) Zero-order diffusion
 - (2) Fickian diffusion from a matrix
 - (3) Osmotic pump release
 - (4) Burst release system
43. The separation of racemic mixture into the pure enantiomer is :
- (1) Resolution
 - (2) Racemization
 - (3) Isomerization
 - (4) All of the above

44. Adulteration of wood powder in red chilli powder is identified using
- | | |
|----------------|--------------------|
| (1) Morphology | (2) Loss on drying |
| (3) Microscopy | (4) Titrimetric |
45. A drug solution follows zero-order kinetics. Which statement is *correct* ?
- (1) $t_{1/2}$ depends on initial concentration
- (2) Rate of drug elimination is constant
- (3) Rate of elimination is proportional to concentration
- (4) Shelf-life cannot be calculated
46. Chitosan nanoparticles primarily utilize which mechanism for mucosal drug delivery ?
- (1) Mucoadhesion due to cationic charge
- (2) P-glycoprotein inhibition
- (3) Receptor-mediated endocytosis
- (4) Osmotic pressure differences
47. Name of the scientist who gave the term Pharmacognosy :
- | | |
|-------------|-----------------|
| (1) Seydler | (2) Charak |
| (3) Sushrut | (4) Hippocrates |
48. Ash value indicate :
- (1) Presence of silicates, oxalates, phosphates
- (2) Presence of chemical composition of plant
- (3) Presence of different cells and tissues
- (4) Presence of Water

49. Wurster coating system is used for :

- (1) Melt extrusion
- (2) Bottom-spray fluid-bed coating of pellets
- (3) Solvent casting membranes
- (4) Dry granulation

50. Resolution in chromatography is maximized by increasing :

- (1) Column length and efficiency
- (2) Flow rate
- (3) Injection volume
- (4) Detector wavelength

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71. BHT and BHA are used in dosage forms as :
- (1) Preservatives
 - (2) Antioxidants
 - (3) Emulsifying agents
 - (4) Chelators
72. Which intermolecular force is strongest ?
- (1) Vander Waals
 - (2) Dipole-dipole
 - (3) Hydrogen bonding
 - (4) London dispersion
73. Indicate the *correct* sequence of steps in rational drug design :
- (1) Hit identification → Target validation → Optimization → Lead identification
 - (2) Target identification → Validation → Lead identification → Optimization
 - (3) Optimization → Lead identification → Target validation → Screening
 - (4) Random screening → Optimization → Target identification

74. Science of collecting, monitoring, researching, assessing and evaluating information from healthcare providers and patients on the adverse effects of medications is known as :
- (1) Clinical Trials
 - (2) Observational study
 - (3) Qualitative study
 - (4) Pharmacovigilance
75. Which of the following is a **correct** statement regarding Type I and Type II errors in hypothesis testing ?
- (1) Type I error is the risk of rejecting the null when it is true; Type II error is failing to reject the null when it is false.
 - (2) Type I error is failing to reject the null when it is false; Type II error is rejecting the null when it is true.
 - (3) They are the same if you set $\alpha = \beta$.
 - (4) Only Type I error matters in superiority clinical trials.
76. In which algorithm does AutoDock perform its docking search ?
- (1) Simulated Annealing
 - (2) Lamarckian Genetic Algorithm
 - (3) Monte Carlo Algorithm
 - (4) Particle Swarm Optimization
77. In QSAR, sterimol parameters represent :
- (1) Lipophilicity
 - (2) Steric bulk
 - (3) H-bonding ability
 - (4) Electronic constant

78. Which one of the following drugs does NOT act through G-Protein coupled receptors ?
- | | |
|-----------------|-------------|
| (1) Epinephrine | (2) Insulin |
| (3) Dopamine | (4) TSH |
79. Which one of the following is a flocculating agent for a negatively charged drug ?
- | | |
|------------------------|------------------------|
| (1) Aluminium chloride | (2) Bentonite |
| (3) Tragacanth | (4) Sodium biphosphate |
80. Coulter counter is used in determination of :
- (1) Particle surface area
 - (2) Particle size
 - (3) Particle volume
 - (4) All of the above
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- | | |
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97. Which capsule size has the largest capacity ?
- | | |
|---------|-------|
| (1) 000 | (2) 0 |
| (3) 2 | (4) 5 |
98. Which detector is most suitable for detecting thermo-labile phytoconstituents during separation ?
- (1) UV detector in HPLC
 - (2) TCD detector in GC
 - (3) RID detector in HPLC
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99. Organoleptic evaluation of crude drugs includes :

- (1) Taste, smell, and microscopic examination
- (2) Taste, color, odor, and appearance
- (3) Odor, TLC profile, and ash values
- (4) Color, odor, and refractive index

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- (1) pH buffering and acid/base catalysts inhibition
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- (3) Adding surfactants only
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(DO NOT OPEN THIS QUESTION BOOKLET BEFORE TIME OR UNTIL YOU
ARE ASKED TO DO SO)



PHD-EE-November, 2025
Pharmaceutical Sciences

SET-X

10044

Sr. No.

Time : 1¼ Hours

Max. Marks : 100

Total Questions : 100

Roll No. (in figures) _____ (in words) _____

Name _____ Date of Birth _____

Father's Name _____ Mother's Name _____

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(Signature of the Candidate)

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**CANDIDATES MUST READ THE FOLLOWING INFORMATION/INSTRUCTIONS BEFORE
STARTING THE QUESTION PAPER.**

1. **All questions are compulsory.**
2. The candidates **must return** the question booklet as well as OMR Answer-Sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means / mis-behaviour will be registered against him / her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.
3. Keeping in view the transparency of the examination system, carbonless OMR Sheet is provided to the candidate so that a copy of OMR Sheet may be kept by the candidate.
4. Question Booklet along with answer key of all the A, B, C & D code shall be got uploaded on the University Website immediately after the conduct of Entrance Examination. Candidates may raise valid objection/complaint if any, with regard to discrepancy in the question booklet/answer key within 24 hours of uploading the same on the University Website. The complaint be sent by the students to the Controller of Examinations by hand or through email. Thereafter, no complaint in any case, will be considered.
5. The candidate **must not** do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the question booklet itself. Answers **must not** be ticked in the question booklet.
6. **There will be negative marking and a deduction of 0.25 marks for each wrong answer. Each correct answer will be awarded one full mark. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.**
7. Use only **Black or Blue Ball Point Pen** of good quality in the OMR Answer-Sheet.
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SEAL

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50. Which parameter changes MOST at high toxic doses due to saturable metabolism ?
- (1) Clearance increases
 - (2) Clearance decreases
 - (3) Elimination becomes 1st-order
 - (4) Bioavailability decreases
51. Which of the following excipients acts as a wetting agent to improve dissolution of poorly soluble drugs ?
- (1) Microcrystalline cellulose
 - (2) Sodium lauryl sulfate
 - (3) Talc
 - (4) Magnesium stearate
52. A drug follows zero-order elimination. Which statement is *true* ?
- (1) $t^{1/2}$ is constant
 - (2) Elimination rate is constant
 - (3) AUC is not dose-dependent
 - (4) Follows the Michaelis-Menten first-order region
53. Which of the following method can be used to determine the number of bacteria quantitatively ?
- (1) Spread-plate
 - (2) Streak-plate
 - (3) Pour-plate and spread plate
 - (4) Pour plate

54. Which transport mechanism is saturated at therapeutic concentrations ?
(1) Passive diffusion (2) Filtration
(3) Active transport (4) Paracellular transport
55. Acetaminophen toxicity is largely due to :
(1) Sulfation (2) Glucuronidation
(3) Oxidative metabolites via CYP2E1 (4) Methylation
56. Rate-limiting step in noradrenaline synthesis :
(1) Dopamine to noradrenaline via DBH
(2) Tyrosine to L-DOPA by tyrosine hydroxylase
(3) L-DOPA to dopamine
(4) Noradrenaline reuptake
57. Which polymer is not commonly used in transdermal patches ?
(1) Ethyl cellulose (2) PVA
(3) Eudragit RL (4) Starch sodium glycolate
58. Among the following, the base value used in Woodward-Fieser rules for open-chain conjugated dienes is :
(1) 214 nm (2) 253 nm
(3) 217 nm (4) 193 nm
59. Which of the following is a buffer solution ?
(1) $H_2SO_4 + CuSO_4$
(2) $CH_3COOH + CH_3COONH_4$
(3) $NaCl + NaOH$
(4) $CH_3COONa + CH_3COOH$

60. In suspension formulations, flocculating agents are added to :
- (1) Increase viscosity
 - (2) Promote controlled particle aggregation
 - (3) Reduce wettability
 - (4) Improve color
61. The McLafferty rearrangement requires :
- (1) Aromatic ring
 - (2) γ -Hydrogen in carbonyl compound
 - (3) Halogen substitution
 - (4) Presence of nitro-group
62. In chromatography, resolution increases when :
- (1) Plate height increases
 - (2) Mobile phase velocity increases
 - (3) Selectivity factor increases
 - (4) Peak broadening increases
63. An electron impact MS typically produces :
- (1) Protonated molecular ion
 - (2) Radical cation M^+
 - (3) Sodium-adduct peak
 - (4) Doubly charged ions only
64. In screening plant extract for anti-epileptic activity, MES and PTZ models are used to differentiate :
- (1) Hepatoprotective and anti-inflammatory response
 - (2) GABA agonistic vs Na^+ channel blocking potential
 - (3) Analgesic vs Antipyretic effects
 - (4) Peripheral vs Central antispasmodic action
65. Which of the following is *not* part of the research methodology section of a thesis ?
- (1) Study design
 - (2) Data collection methods
 - (3) Literature review summary
 - (4) Statistical analysis plan

66. In MALDI-TOF MS, ionization primarily occurs by :
- (1) Electron bombardment
 - (2) Desorption with matrix and pulsed laser
 - (3) Electrospray nebulization
 - (4) Plasma interaction
67. Capillary GC columns are preferred due to :
- (1) Low theoretical plates
 - (2) High efficiency & minimal sample loading
 - (3) High column diameter
 - (4) Poor peak resolution
68. The Cotton effect is associated with :
- (1) CD spectroscopy optical activity in chiral chromophores
 - (2) Raman active modes
 - (3) Hyperfine splitting in NMR
 - (4) Ion trap MS
69. Which of the following statements best describes a lead compound ?
- (1) A compound that contains the element lead.
 - (2) A compound from the research laboratory that is chosen to go forward for preclinical and clinical trials.
 - (3) A molecule that shows some activity or property of interest and serves as the starting point for the development of a drug.
 - (4) The first compound of a structural class of compounds to reach the market.
70. Which β -lactam antibiotic belongs to carbapenem class ?
- (1) Meropenem
 - (2) Ceftriaxone
 - (3) Amoxicillin
 - (4) Nafcillin

71. During film coating, orange-peel effect is primarily due to :
- (1) Excessive spray rate
 - (2) High polymer viscosity and improper atomization
 - (3) Low pan temperature
 - (4) Excess plasticizer
72. Controlled-release tablets rely on Higuchi square-root law which is applicable to :
- (1) Zero-order diffusion
 - (2) Fickian diffusion from a matrix
 - (3) Osmotic pump release
 - (4) Burst release system
73. The separation of racemic mixture into the pure enantiomer is :
- (1) Resolution
 - (2) Racemization
 - (3) Isomerization
 - (4) All of the above
74. Adulteration of wood powder in red chilli powder is identified using
- (1) Morphology
 - (2) Loss on drying
 - (3) Microscopy
 - (4) Titrimetric
75. A drug solution follows zero-order kinetics. Which statement is *correct* ?
- (1) $t_{1/2}$ depends on initial concentration
 - (2) Rate of drug elimination is constant
 - (3) Rate of elimination is proportional to concentration
 - (4) Shelf-life cannot be calculated

76. Chitosan nanoparticles primarily utilize which mechanism for mucosal drug delivery ?
- (1) Mucoadhesion due to cationic charge
 - (2) P-glycoprotein inhibition
 - (3) Receptor-mediated endocytosis
 - (4) Osmotic pressure differences
77. Name of the scientist who gave the term Pharmacognosy :
- (1) Seydler
 - (2) Charak
 - (3) Sushrut
 - (4) Hippocrates
78. Ash value indicate :
- (1) Presence of silicates, oxalates, phosphates
 - (2) Presence of chemical composition of plant
 - (3) Presence of different cells and tissues
 - (4) Presence of Water
79. Wurster coating system is used for :
- (1) Melt extrusion
 - (2) Bottom-spray fluid-bed coating of pellets
 - (3) Solvent casting membranes
 - (4) Dry granulation
80. Resolution in chromatography is maximized by increasing :
- (1) Column length and efficiency
 - (2) Flow rate
 - (3) Injection volume
 - (4) Detector wavelength

81. In formulating a null hypothesis for a two-arm superiority trial, you decide : "There is no difference in mean survival between Drug X and standard care." What type of hypothesis is this ?
- (1) Alternative hypothesis (2) Null hypothesis
(3) Research hypothesis (4) Working hypothesis
82. The term "cross-over design" implies that :
- (1) Subjects cross over from control to treatment at midpoint with no wash-out
(2) Each subject receives all interventions in a defined sequence with wash-out periods
(3) Investigators cross over roles halfway
(4) Randomization is not required
83. A drug shows a longer half-life after oral dosing than after IV dosing. What is the most likely reason ?
- (1) Absorption is slower than elimination
(2) Elimination is slower than absorption
(3) Drug is highly protein-bound
(4) Bioavailability increased
84. The rate-limiting step in oral absorption of BCS class II drug is :
- (1) Dissolution (2) Permeability
(3) Stability (4) Transit time
85. Intrinsic activity = 0 but affinity = high describes :
- (1) Full agonist (2) Partial agonist
(3) Neutral antagonist (4) Inverse agonist

86. In reporting a randomized trial, omission of the allocation concealment mechanism weakens the report because :
- (1) It increases the risk of selection bias
 - (2) It affects external validity
 - (3) It reduces sample size
 - (4) It invalidates ethics approval
87. For a study of non-parametric data from three independent groups, the correct test is :
- (1) One-way ANOVA
 - (2) Kruskal-Wallis test
 - (3) Mann-Whitney U test
 - (4) Paired t-test
88. In a cohort study, researchers follow exposed and unexposed groups forward. This is :
- (1) Experimental design
 - (2) Observational analytical design
 - (3) Case-control design
 - (4) Cross-sectional design
89. EC50 represents :
- (1) Dose at 50% receptor occupancy
 - (2) Dose causing 50% toxicity
 - (3) Concentration at max binding
 - (4) Dose producing 50% max response
90. A xenobiotic bioactivates to a toxic metabolite via :
- (1) Phase III transporters
 - (2) Phase II glucuronidation
 - (3) Phase I CYP450 oxidation
 - (4) Lysosomal degradation

91. BHT and BHA are used in dosage forms as :

- (1) Preservatives
- (2) Antioxidants
- (3) Emulsifying agents
- (4) Chelators

92. Which intermolecular force is strongest ?

- (1) Vander Waals
- (2) Dipole-dipole
- (3) Hydrogen bonding
- (4) London dispersion

93. Indicate the *correct* sequence of steps in rational drug design :

- (1) Hit identification → Target validation → Optimization → Lead identification
- (2) Target identification → Validation → Lead identification → Optimization
- (3) Optimization → Lead identification → Target validation → Screening
- (4) Random screening → Optimization → Target identification

94. Science of collecting, monitoring, researching, assessing and evaluating information from healthcare providers and patients on the adverse effects of medications is known as :

- (1) Clinical Trials
- (2) Observational study
- (3) Qualitative study
- (4) Pharmacovigilance

95. Which of the following is a *correct* statement regarding Type I and Type II errors in hypothesis testing ?
- (1) Type I error is the risk of rejecting the null when it is true; Type II error is failing to reject the null when it is false.
 - (2) Type I error is failing to reject the null when it is false; Type II error is rejecting the null when it is true.
 - (3) They are the same if you set $\alpha = \beta$.
 - (4) Only Type I error matters in superiority clinical trials.
96. In which algorithm does AutoDock perform its docking search ?
- (1) Simulated Annealing
 - (2) Lamarckian Genetic Algorithm
 - (3) Monte Carlo Algorithm
 - (4) Particle Swarm Optimization
97. In QSAR, sterimol parameters represent :
- (1) Lipophilicity
 - (2) Steric bulk
 - (3) H-bonding ability
 - (4) Electronic constant
98. Which one of the following drugs does NOT act through G-Protein coupled receptors ?
- (1) Epinephrine
 - (2) Insulin
 - (3) Dopamine
 - (4) TSH
99. Which one of the following is a flocculating agent for a negatively charged drug ?
- (1) Aluminium chloride
 - (2) Bentonite
 - (3) Tragacanth
 - (4) Sodium biphosphate

100. Coulter counter is used in determination of :

- (1) Particle surface area
- (2) Particle size
- (3) Particle volume
- (4) All of the above

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S.No.	SeT A	Set B	Set C	Set D
1	B	A	B	C
2	B	C	C	A
3	A	B	B	B
4	A	A	B	C
5	C	B	C	B
6	A	A	B	B
7	B	B	B	C
8	B	C	A	B
9	D	A	C	B
10	C	B	A	B
11	C	B	B	B
12	A	C	B	A
13	B	D	C	B
14	C	B	C	C
15	B	B	C	D
16	B	D	B	B
17	C	A	D	C
18	B	A	A	B
19	B	B	D	C
20	B	A	B	B
21	B	C	B	A
22	B	B	B	C
23	C	A	A	B
24	C	C	A	A
25	C	C	C	B
26	B	C	A	A
27	D	D	B	B
28	A	C	B	C
29	D	A	D	A
30	B	B	C	B
31	C	C	B	B
32	B	A	A	C
33	A	B	B	D
34	C	C	C	B
35	C	B	D	B
36	C	B	B	D
37	D	C	C	A
38	C	B	B	A
39	A	B	C	B
40	B	B	B	A
41	B	B	B	C
42	C	A	B	B
43	B	B	A	A
44	B	C	C	C

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45	C	D	B	C
46	B	B	A	C
47	B	C	A	D
48	A	B	A	C
49	C	C	B	A
50	A	B	A	B
51	B	B	C	B
52	C	B	B	B
53	D	A	A	C
54	B	C	C	C
55	B	B	C	C
56	D	A	C	B
57	A	A	D	D
58	A	A	C	A
59	B	B	A	D
60	A	A	B	B
61	B	B	A	B
62	B	C	C	C
63	A	B	B	B
64	C	D	A	B
65	B	A	B	C
66	A	B	A	B
67	A	B	B	B
68	A	B	C	A
69	B	A	A	C
70	A	D	B	A
71	A	B	B	B
72	C	C	C	B
73	B	B	B	A
74	A	B	D	C
75	B	C	A	B
76	A	B	B	A
77	B	B	B	A
78	C	A	B	A
79	A	C	A	B
80	B	A	D	A
81	B	B	C	B
82	C	B	A	B
83	B	C	B	A
84	D	C	C	A
85	A	C	B	C
86	B	B	B	A
87	B	D	C	B
88	B	A	B	B
89	A	D	B	D
90	D	B	B	C

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91	B	B	B	B
92	A	B	C	C
93	B	A	D	B
94	C	A	B	D
95	D	C	B	A
96	B	A	D	B
97	C	B	A	B
98	B	B	A	B
99	C	D	B	A
100	B	C	A	D

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