

OJEE M Pharm Sample Paper 01

A) Mode and Time: The exam is a Computer Based Test (CBT) lasting 60 minutes.

B) Total Questions: The exam contains 60 questions.

C) Marking Scheme & Rules:

- +4 marks for each correct answer; -1 mark for each incorrect answer.

Q1. In the Hydrophilic-Lipophilic Balance (HLB) scale, a value of 15.0 indicates that the surfactant is most suitable for use as a:

- A. Water-in-oil (w/o) emulsifier
- B. Wetting agent
- C. Solubilizing agent
- D. Oil-in-water (o/w) emulsifier

Q2. During tablet manufacturing, the defect known as "Capping" is primarily caused by:

- A. Excessive moisture in the granules
- B. Entrapment of air in the die cavity
- C. High machine speed
- D. Over-drying of granules

Q3. What is the approximate fill capacity of an empty hard gelatin capsule of size '00'?

- A. 0.13 ml
- B. 0.37 ml
- C. 0.68 ml
- D. 1.37 ml

Q4. Which method is considered the most appropriate for the sterilization of heat-sensitive liquid medications (like insulin or vaccines)?

- A. Autoclaving at 121°C
- B. Dry heat sterilization at 160°C
- C. Membrane filtration ($0.22\ \mu\text{m}$)
- D. Ethylene oxide gas sterilization

Q5. Carr's Compressibility Index is fundamentally used in pharmaceuticals to evaluate which physical property of a powder?

- A. Particle size distribution
- B. Moisture content
- C. Flow property
- D. True density

Q6. In rheology, 'Bingham plastic flow' is characteristically exhibited by which of the following pharmaceutical systems?

- A. Flocculated suspensions
- B. Deflocculated suspensions
- C. Simple Newtonian liquids
- D. Dilute emulsions

Q7. Which of the following polymers is most widely used for the enteric coating of tablets to prevent drug release in the stomach?

- A. Hydroxypropyl methylcellulose (HPMC)
- B. Cellulose acetate phthalate (CAP)
- C. Polyethylene glycol (PEG)
- D. Polyvinylpyrrolidone (PVP)

Q8. The Limulus Amebocyte Lysate (LAL) test is an in-vitro assay specifically designed to detect the presence of:

- A. Heavy metals
- B. Microbial contamination
- C. Pyrogens (Bacterial endotoxins)
- D. Fungal spores

Q9. According to the USP classification of pharmaceutical glass containers, Type II glass is officially described as:

- A. Highly resistant borosilicate glass
- B. Treated soda-lime glass
- C. Regular soda-lime glass

D. General-purpose non-parenteral glass

Q10. Commercially available 'Spans' (used as non-ionic surfactants) are chemically classified as:

- A. Polyoxyethylene sorbitan esters
- B. Sorbitan esters of fatty acids
- C. Sodium alkyl sulfates
- D. Quaternary ammonium compounds

Q11. Which of the following Non-Steroidal Anti-Inflammatory Drugs (NSAIDs) acts as a highly selective COX-2 inhibitor?

- A. Ibuprofen
- B. Aspirin
- C. Celecoxib
- D. Indomethacin

Q12. The mechanism of action of Omeprazole in the treatment of peptic ulcers involves the irreversible inhibition of:

- A. H₂ histamine receptors
- B. H⁺/K⁺ ATPase (Proton pump)
- C. Muscarinic M₁ receptors
- D. Gastrin receptors

Q13. What is the specific, life-saving antidote administered for severe Acetaminophen (Paracetamol) poisoning?

- A. Naloxone
- B. Flumazenil
- C. Atropine
- D. N-acetylcysteine

Q14. High-ceiling 'Loop diuretics' like Furosemide exert their primary pharmacological effect on which segment of the nephron?

- A. Proximal convoluted tubule
- B. Descending limb of the Loop of Henle

- C. Thick ascending limb of the Loop of Henle
- D. Distal convoluted tubule

Q15. Which of the following Angiotensin-Converting Enzyme (ACE) inhibitors is administered as a prodrug and must be converted to its active diacid form in the liver?

- A. Captopril
- B. Lisinopril
- C. Enalapril
- D. Losartan

Q16. Erythromycin, Azithromycin, and Clarithromycin belong to which chemical class of antibiotics?

- A. Aminoglycosides
- B. Tetracyclines
- C. Macrolides
- D. Fluoroquinolones

Q17. The "First-pass effect" (or presystemic metabolism) significantly reduces the bioavailability of a drug when it is administered via which route?

- A. Intravenous
- B. Sublingual
- C. Oral
- D. Transdermal

Q18. In the context of clinical trials for new drugs, Phase II trials are primarily designed to evaluate:

- A. Pharmacokinetics in healthy volunteers
- B. Efficacy and short-term safety in patients with the target disease
- C. Post-marketing surveillance
- D. Toxicity in animal models

Q19. Which of the following anticholinesterase drugs is the preferred treatment for the autoimmune neuromuscular disease Myasthenia Gravis?

- A. Physostigmine

- B. Neostigmine
- C. Donepezil
- D. Echothiophate

Q20. The oral anticoagulant Warfarin exerts its therapeutic effect by competitively inhibiting the enzyme:

- A. Thrombin
- B. Factor Xa
- C. Vitamin K epoxide reductase
- D. Cyclooxygenase

Q21. Salbutamol (Albuterol) provides rapid relief in bronchial asthma because it acts as a:

- A. Short-acting Beta-2 adrenergic agonist
- B. Long-acting Beta-2 adrenergic agonist
- C. Muscarinic receptor antagonist
- D. Leukotriene receptor antagonist

Q22. The simultaneous use of Aminoglycoside antibiotics and Loop diuretics significantly increases the risk of which severe adverse effect?

- A. Hepatotoxicity
- B. Cardiotoxicity
- C. Ototoxicity
- D. Myopathy

Q23. Which of the following drugs is a pure, competitive opioid receptor antagonist used to completely reverse opioid overdoses?

- A. Methadone
- B. Buprenorphine
- C. Naloxone
- D. Fentanyl

Q24. The highly effective antimalarial compound Artemisinin is naturally extracted from which traditional medicinal plant?

- A. Cinchona officinalis
- B. Artemisia annua
- C. Atropa belladonna
- D. Papaver somniferum

Q25. Statins, such as Atorvastatin, lower plasma cholesterol levels by competitively inhibiting which rate-limiting enzyme?

- A. Lipoprotein lipase
- B. Cholesterol ester transfer protein
- C. HMG-CoA reductase
- D. Cyclooxygenase-1

Q26. In the industrial synthesis of Paracetamol (Acetaminophen), the primary starting material is typically:

- A. Salicylic acid
- B. p-Aminophenol
- C. Aniline
- D. Phenol

Q27. The fundamental structural feature responsible for the antibacterial activity of Penicillins and Cephalosporins is the:

- A. Thiazolidine ring
- B. Beta-lactam ring
- C. Dihydrothiazine ring
- D. Piperazine ring

Q28. The active pharmaceutical ingredient Diazepam contains which fundamental heterocyclic ring structure?

- A. Phenothiazine
- B. Quinoline
- C. 1,4-Benzodiazepine
- D. Indole

Q29. The basic Tropane ring system, found in alkaloids like Atropine and Cocaine, is a bicyclic molecule composed of:

- A. Pyrrolidine and Piperidine rings
- B. Imidazole and Pyrimidine rings
- C. Pyridine and Pyrrole rings
- D. Quinoline and Isoquinoline rings

Q30. In the Indian Pharmacopoeia limit test for Iron, which specific reagent is used to form a purple/pink colored complex with iron?

- A. Barium chloride
- B. Silver nitrate
- C. Thioglycolic acid
- D. Hydrogen sulfide

Q31. Phase I drug metabolism reactions in the liver generally include all of the following EXCEPT:

- A. Oxidation
- B. Reduction
- C. Hydrolysis
- D. Glucuronidation

Q32. Chemically, the widely used analgesic drug Aspirin is precisely defined as:

- A. Acetylsalicylic acid
- B. Methyl salicylate
- C. Sodium salicylate
- D. Phenyl salicylate

Q33. The Karl Fischer titration method is an extremely sensitive analytical technique specifically used to determine the:

- A. Chloride content
- B. Heavy metal limit
- C. Moisture (Water) content
- D. Alcohol content

Q34. Isoniazid (INH), a first-line antitubercular agent, is chemically known as:

- A. Nicotinic acid amide
- B. Isonicotinic acid hydrazide
- C. Pyrazinoic acid amide
- D. p-Aminosalicylic acid

Q35. Sulfonamide drugs (sulfa drugs) exhibit bacteriostatic activity by competitively inhibiting the bacterial enzyme:

- A. DNA gyrase
- B. Transpeptidase
- C. Dihydropteroate synthase
- D. RNA polymerase

Q36. The Vitali-Morin test produces a vivid purple color and is a specific chemical identification test for:

- A. Cardiac glycosides
- B. Tropane alkaloids
- C. Anthraquinone glycosides
- D. Triterpenoids

Q37. The widely used stimulant laxative Senna belongs to which botanical family?

- A. Solanaceae
- B. Leguminosae
- C. Rubiaceae
- D. Apocynaceae

Q38. The primary active chemical constituent responsible for the distinct aroma and dental analgesic properties of Clove oil is:

- A. Menthol
- B. Camphor
- C. Eugenol
- D. Cineole

Q39. Pharmacognostically, Ergot (a source of alkaloids used for migraines and postpartum bleeding) is classified as a:

- A. Dried latex of a poppy
- B. Fungus growing on rye
- C. Dried rhizome
- D. Leaf extract

Q40. The Keller-Kiliani test is an analytical color reaction specifically utilized to identify the presence of:

- A. Deoxysugars in cardiac glycosides
- B. Indole alkaloids
- C. Volatile oils
- D. Tannins

Q41. The potent antihypertensive and antipsychotic alkaloid Reserpine is extracted from the dried roots of:

- A. Digitalis purpurea
- B. Rauwolfia serpentina
- C. Catharanthus roseus
- D. Cinchona calisaya

Q42. In the human biosynthetic pathway, which 30-carbon acyclic triterpene serves as the direct biochemical precursor to cholesterol?

- A. Mevalonic acid
- B. Isoprene
- C. Squalene
- D. Lanosterol

Q43. The vinca alkaloids Vincristine and Vinblastine arrest cell division during metaphase by binding specifically to:

- A. DNA topoisomerase
- B. Ribosomal RNA
- C. Tubulin (microtubules)
- D. DNA polymerase

Q44. In pharmacognosy, Guggul (*Commiphora wightii*), used for its hypolipidemic activity, is physically classified as an:

- A. Oleoresin
- B. Gum
- C. Oleogum resin
- D. Balsam

Q45. Strychnine, a highly toxic alkaloid that causes severe muscular convulsions by blocking glycine receptors, is obtained from:

- A. *Strychnos nux-vomica*
- B. *Erythroxylum coca*
- C. *Aconitum napellus*
- D. *Physostigma venenosum*

Q46. In High-Performance Liquid Chromatography (HPLC), "Normal-phase" chromatography specifically refers to a system utilizing a:

- A. Non-polar stationary phase and a polar mobile phase
- B. Polar stationary phase and a non-polar mobile phase
- C. Gaseous mobile phase and a solid stationary phase
- D. Liquid stationary phase and a gaseous mobile phase

Q47. The fundamental principle of quantitative UV-Visible spectroscopy is mathematically expressed by:

- A. Bragg's Law
- B. Beer-Lambert's Law
- C. Hooke's Law
- D. Faraday's Law

Q48. Infrared (IR) spectroscopy is primarily used in pharmaceutical analysis to deduce molecular structure by measuring:

- A. Electronic transitions
- B. Nuclear spin resonance
- C. Vibrational transitions of chemical bonds
- D. Mass-to-charge ratios

Q49. In Nuclear Magnetic Resonance (NMR) spectroscopy, which inert compound is universally added as the internal reference standard (assigned a chemical shift of 0 ppm)?

- A. Tetramethylsilane (TMS)
- B. Chloroform-d
- C. Deuterium oxide
- D. Dimethyl sulfoxide (DMSO)

Q50. Which highly sensitive detector is most commonly paired with Gas Chromatography (GC) for the specific analysis of halogenated organic compounds?

- A. Flame Ionization Detector (FID)
- B. Thermal Conductivity Detector (TCD)
- C. Electron Capture Detector (ECD)
- D. Refractive Index Detector (RID)

Q51. The analytical technique of Polarography relies on the measurement of current-voltage curves using a unique working electrode known as the:

- A. Standard Hydrogen Electrode
- B. Glass Electrode
- C. Dropping Mercury Electrode (DME)
- D. Calomel Electrode

Q52. In the complexometric titration of Calcium ions using EDTA, which indicator is traditionally used to detect the endpoint?

- A. Phenolphthalein
- B. Methyl orange
- C. Eriochrome Black T (EBT) / Murexide
- D. Starch solution

Q53. In pharmacokinetics, the apparent Volume of Distribution (V_d) is mathematically calculated by dividing the total dose administered by the:

- A. Clearance rate
- B. Elimination half-life
- C. Initial plasma drug concentration
- D. Area Under the Curve (AUC)

Q54. By pharmacological definition, the absolute systemic bioavailability (F) of a drug administered via an intravenous (IV) bolus injection is:

- A. 0%
- B. 50%
- C. 75%
- D. 100%

Q55. Phenytoin and Aspirin at high doses exhibit capacity-limited (non-linear) pharmacokinetics, which are best described mathematically by:

- A. First-order kinetics
- B. Zero-order kinetics
- C. Michaelis-Menten kinetics
- D. Second-order kinetics

Q56. The pharmacokinetic parameter representing the theoretical volume of blood plasma from which a drug is completely removed per unit of time is called:

- A. Clearance
- B. Volume of distribution
- C. Half-life
- D. Absorption rate constant

Q57. The Pharmacy Act, which formally established the Pharmacy Council of India and regulated the profession of pharmacy, was passed in the year:

- A. 1940
- B. 1948
- C. 1955
- D. 1970

Q58. Under the Indian Drugs and Cosmetics Act of 1940, Schedule X specifically dictates the regulations pertaining to:

- A. Good Manufacturing Practices (GMP)
- B. Biological and special products
- C. Narcotic drugs and psychotropic substances
- D. Life periods (expiry dates) of drugs

Q59. Gram staining, a fundamental microbiological technique, differentiates bacterial species primarily based on the thickness of their:

- A. Plasma membrane
- B. Lipopolysaccharide layer
- C. Capsule
- D. Peptidoglycan cell wall

Q60. For standard steam sterilization in an autoclave, what are the universally accepted conditions required to ensure the complete destruction of bacterial endospores?

- A. 100°C for 30 minutes at 0 psi
- B. 121°C for 15 minutes at 15 psi
- C. 160°C for 60 minutes at 10 psi
- D. 134°C for 3 minutes at 30 psi

Solutions

1. D

Explanation: The HLB scale ranges from 0 to 20. Surfactants with an HLB value between 8 and 18 are highly hydrophilic, making them excellent emulsifying agents for oil-in-water (o/w) emulsions.

2. B

Explanation: Capping is a tablet defect where the upper or lower crown of the tablet separates from the main body. It is primarily caused by air entrapped in the granular material during compression.

3. C

Explanation: Empty hard gelatin capsules are sized numerically. Size '00' is the second largest standard size used for humans, with an approximate volume capacity of 0.68 ml.

4. C

Explanation: Heat-sensitive liquids (thermolabile solutions) cannot withstand autoclaving or dry heat. They are sterilized by passing them through a $0.22\ \mu\text{m}$ membrane filter, which physically removes bacteria.

5. C

Explanation: Carr's Compressibility Index and the Hausner ratio are simple, frequently used empirical methods to evaluate the flowability of powder blends prior to tablet compression.

6. A

Explanation: Bingham plastic flow is a non-Newtonian behavior where the liquid requires a minimum shear stress (yield value) to begin flowing. It is typically exhibited by concentrated, flocculated pharmaceutical suspensions.

7. B

Explanation: Cellulose acetate phthalate (CAP) is a classic enteric polymer. It remains insoluble in the acidic pH of the stomach but dissolves readily in the mildly alkaline environment of the intestines.

8. C

Explanation: The LAL test uses an extract from the blood of the horseshoe crab to detect incredibly small quantities of bacterial endotoxins (pyrogens) in parenteral solutions.

9. B

Explanation: Type II glass is commercial soda-lime glass that has been internally treated with sulfur dioxide to neutralize surface alkalinity, making it suitable for buffered aqueous parenteral solutions.

10. B

Explanation: 'Spans' are lipophilic, non-ionic surfactants chemically composed of sorbitan esters of fatty acids. (Conversely, 'Tweens' are hydrophilic polyoxyethylene sorbitan esters).

11. C

Explanation: Celecoxib belongs to the "coxib" class of NSAIDs, which were specif-

ically designed to selectively inhibit the COX-2 enzyme to reduce inflammation without causing severe COX-1 related gastrointestinal bleeding.

12. B

Explanation: Omeprazole is a Proton Pump Inhibitor (PPI). It covalently and irreversibly binds to the H⁺/K⁺ ATPase enzyme on the apical membrane of gastric parietal cells, shutting down acid secretion.

13. D

Explanation: Paracetamol overdose depletes hepatic glutathione. N-acetylcysteine acts as a glutathione substitute, binding the toxic metabolite NAPQI and preventing fatal hepatotoxicity.

14. C

Explanation: Loop diuretics like furosemide block the Na⁺/K⁺/2Cl⁻ symporter situated specifically in the thick ascending limb of the Loop of Henle, causing profound diuresis.

15. C

Explanation: Enalapril is an inactive prodrug. It must be rapidly hydrolyzed by hepatic esterases into its active dicarboxylic acid form, enalaprilat, to effectively inhibit the ACE enzyme.

16. C

Explanation: These drugs belong to the Macrolide class, characterized by a large macrocyclic lactone ring. They act by binding to the 50S ribosomal subunit, inhibiting bacterial protein synthesis.

17. C

Explanation: When administered orally, drugs are absorbed into the portal vein and pass directly through the liver, where extensive presystemic (first-pass) metabolism can drastically reduce the amount of active drug reaching systemic circulation.

18. B

Explanation: Phase II clinical trials are the first time a new drug is tested on patients actually suffering from the target disease, primarily to establish proof-of-concept efficacy and determine appropriate dosing.

19. B

Explanation: Neostigmine is a reversible acetylcholinesterase inhibitor that does not cross the blood-brain barrier. It increases acetylcholine levels at the neuromuscular junction, temporarily restoring muscle strength in Myasthenia Gravis patients.

20. C

Explanation: Warfarin acts by blocking the enzyme Vitamin K epoxide reductase (VKORC1), preventing the recycling of Vitamin K and subsequently halting the synthesis of active clotting factors II, VII, IX, and X.

21. A

Explanation: Salbutamol is a highly selective, short-acting β_2 -adrenergic receptor agonist. It relaxes bronchial smooth muscle, providing rapid relief during acute asthma attacks.

22. C

Explanation: Both aminoglycosides (like gentamicin) and loop diuretics (like

furosemide) carry an independent risk of causing damage to the inner ear (ototoxicity). Co-administering them drastically multiplies this risk, potentially causing permanent deafness.

23. C

Explanation: Naloxone is a pure competitive antagonist at μ , κ , and δ opioid receptors. It is the standard emergency treatment to reverse respiratory depression caused by opioid overdoses.

24. B

Explanation: Artemisinin is a potent antimalarial sesquiterpene lactone containing an unusual peroxide bridge, isolated from the sweet wormwood plant, *Artemisia annua*.

25. C

Explanation: Statins lower cholesterol by competitively inhibiting HMG-CoA reductase, the rate-limiting enzyme responsible for the endogenous hepatic synthesis of mevalonate, an early precursor of cholesterol.

26. B

Explanation: Paracetamol is chemically synthesized via the acetylation of p-aminophenol using acetic anhydride.

27. B

Explanation: The four-membered β -lactam ring is the core pharmacophore of penicillins and cephalosporins. It covalently binds to bacterial transpeptidases (Penicillin-Binding Proteins), halting cell wall synthesis.

28. C

Explanation: Diazepam is a classic minor tranquilizer belonging to the Benzodiazepine class, characterized by a fused benzene and 1,4-diazepine heterocyclic ring system.

29. A

Explanation: The tropane ring is a bridged bicyclic nitrogen-containing compound formed by the fusion of a five-membered pyrrolidine ring and a six-membered piperidine ring sharing a common nitrogen atom and two carbon atoms.

30. C

Explanation: In the IP limit test for iron, thioglycolic acid reduces Fe(III) to Fe(II), and then forms a coordination complex with Fe(II) in an ammoniacal alkaline medium, yielding a pale pink to deep purple color.

31. D

Explanation: Glucuronidation is a synthetic Phase II (conjugation) reaction, where a bulky endogenous molecule is attached to a drug to make it highly water-soluble. Phase I reactions (functionalization) include oxidation, reduction, and hydrolysis.

32. A

Explanation: Aspirin is synthesized by the esterification of the phenolic hydroxyl group of salicylic acid with acetic anhydride, producing acetylsalicylic acid.

33. C

Explanation: The Karl Fischer method is the definitive pharmacopeial standard

for the precise quantitative determination of small amounts of water in pharmaceutical solids and liquids, relying on the oxidation of sulfur dioxide by iodine in the presence of water.

34. B

Explanation: Isoniazid, famously abbreviated as INH, stands for Isonicotinic acid hydrazide. It is a prodrug that disrupts the synthesis of mycolic acids in the mycobacterial cell wall.

35. C

Explanation: Sulfa drugs are structural analogs of para-aminobenzoic acid (PABA). They competitively inhibit the bacterial enzyme dihydropteroate synthase, starving the bacteria of the folate necessary for DNA synthesis.

36. B

Explanation: The Vitali-Morin test identifies tropane alkaloids (like atropine, hyoscine). The drug is treated with fuming nitric acid, evaporated, and reacted with methanolic KOH to produce a characteristic purple color.

37. B

Explanation: Senna is obtained from the dried leaflets of *Cassia angustifolia* or *Cassia acutifolia*, which belong to the Leguminosae (pea) plant family.

38. C

Explanation: Eugenol (a phenylpropene) makes up 70-90% of clove essential oil. It is highly valued in dentistry for its local anesthetic and mild antiseptic properties.

39. B

Explanation: Ergot is the dried sclerotium of a fungus, *Claviceps purpurea*, that grows parasitically on the ovaries of rye plants. It yields potent alkaloids like ergotamine and ergometrine.

40. A

Explanation: The Keller-Kiliani test is highly specific for the detection of 2-deoxysugars (such as digitoxose) found uniquely in the molecular structure of cardiac glycosides like digoxin.

41. B

Explanation: Reserpine is an indole alkaloid isolated from the dried roots of the Indian snakeroot plant, *Rauwolfia serpentina*. It depletes catecholamines from peripheral sympathetic nerve endings.

42. C

Explanation: Squalene is a 30-carbon linear triterpene. In eukaryotic cells, squalene undergoes enzymatic cyclization to form lanosterol, which is subsequently modified into cholesterol.

43. C

Explanation: Vincristine and Vinblastine are cytotoxic antineoplastics. They bind to the protein tubulin, preventing it from polymerizing into microtubules, thereby arresting the cell cycle at metaphase.

44. C

Explanation: Guggul is an oleogum resin exudate collected from the bark of *Commiphora wightii*. It contains a mixture of volatile oils, gums, and resinous sterols.

(guggulsterones).

45. A

Explanation: Strychnine is a fiercely toxic, crystalline alkaloid extracted from the seeds of the *Strychnos nux-vomica* tree. It acts as an antagonist at inhibitory glycine receptors in the spinal cord.

46. B

Explanation: In early "Normal-phase" chromatography, the stationary phase is highly polar (e.g., silica gel) and the mobile phase is non-polar (e.g., hexane). Modern "Reverse-phase" chromatography flips this arrangement.

47. B

Explanation: Beer-Lambert's law states that the absorbance of a solution is directly proportional to the concentration of the absorbing species and the path length of the light passing through it ($A = \epsilon bc$).

48. C

Explanation: IR spectroscopy exposes molecules to infrared light, causing the chemical bonds to stretch and bend. These unique vibrational transitions act as molecular fingerprints for identifying functional groups.

49. A

Explanation: Tetramethylsilane (TMS) is universally used as the internal standard in ^1H and ^{13}C NMR because its highly shielded protons produce a sharp, distinct peak that defines the 0 ppm reference mark.

50. C

Explanation: The Electron Capture Detector (ECD) is extremely sensitive to highly electronegative atoms like halogens, making it the ideal GC detector for analyzing environmental pesticides and fluorinated/chlorinated drugs.

51. C

Explanation: Polarography is a specialized subset of voltammetry that utilizes a Dropping Mercury Electrode (DME) as the working electrode, offering a constantly renewable, clean metallic surface for redox reactions.

52. C

Explanation: Eriochrome Black T (EBT) is a metallochromic indicator. It forms a wine-red complex with calcium/magnesium ions. When EDTA fully chelates the metal, the indicator is freed, turning the solution a distinct blue.

53. C

Explanation: The theoretical Volume of Distribution (V_d) is calculated as the total amount of drug in the body (Dose) divided by the initial plasma concentration (C_0) immediately following an IV bolus.

54. D

Explanation: Intravenous (IV) administration places the entire dose directly into the systemic circulation, entirely bypassing the absorption phase and first-pass metabolism, yielding an absolute bioavailability of 100% ($F = 1.0$).

55. C

Explanation: Drugs like Phenytoin undergo non-linear kinetics because their elimination enzymes become saturated at therapeutic doses. This capacity-limited pro-

cess is mathematically modeled using Michaelis-Menten kinetics.

56. A

Explanation: Clearance (Cl) is defined pharmacokinetically as the theoretical volume of plasma that is completely cleared of a drug per unit of time (e.g., ml/min), representing the body's efficiency in eliminating the drug.

57. B

Explanation: The Pharmacy Act was enacted in 1948 to regulate the profession and practice of pharmacy in India, establishing strict educational standards and forming the Pharmacy Council of India (PCI).

58. C

Explanation: Schedule X of the Drugs and Cosmetics Rules lists narcotic and psychotropic drugs that cause profound addiction and abuse. They require strict, highly regulated storage, dispensing, and record-keeping procedures.

59. D

Explanation: Gram-positive bacteria have a thick, highly cross-linked peptidoglycan cell wall that firmly retains the primary crystal violet stain. Gram-negative bacteria have a thin layer and lose the primary stain when washed with alcohol.

60. B

Explanation: The gold standard physical conditions for ensuring complete sterilization via a steam autoclave are maintaining a temperature of 121° C under 15 psi (pounds per square inch) of pressure for a minimum of 15 minutes.