

JELET Pharmacy Sample Paper-4

Duration: 120 Minutes

Maximum Marks: 100

Instructions

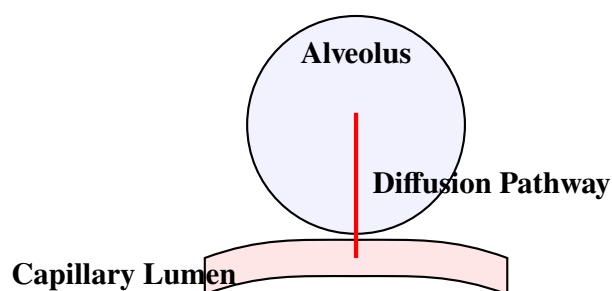
- This paper contains **100** Multiple Choice Questions (Single Correct).
- Each correct answer carries **+1 marks**.
- Each incorrect answer carries: **-0.25** marks.
- Unattempted questions carry **0** marks.
- Only one option is correct for each question.
- Use of mobile phones, smartwatches, calculators, or any electronic gadgets is strictly prohibited.

Q1. A patient is prescribed an oral liquid dosage form that contains a volatile therapeutic agent. To minimize chemical degradation due to oxidation and evaporation, which of the following packaging and storage guidelines is most critical?

- (A) Store in a clear polyvinyl chloride container with a high-density polyethylene closure at room temperature.
- (B) Store in a well-filled, tightly closed amber glass container with an airtight seal in a cool place.
- (C) Store in a wide-mouth polystyrene jar covered with aluminum foil at elevated temperatures.
- (D) Store in a multi-dose light-resistant paperboard carton kept in a humid environment.

Q2. The diagram below outlines the structural layout of a specific anatomical unit involved in external respiration. Identify the major site where the maximum partial pressure gradient of oxygen triggers rapid passive diffusion across the respiratory membrane.



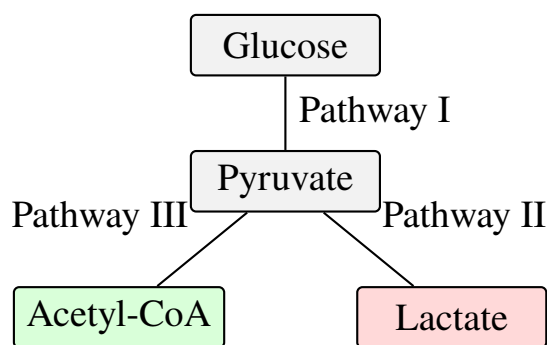


- (A) Tracheobronchial segment adjacent to cartilage rings
 - (B) Terminal bronchiolar walls containing smooth muscle bundles
 - (C) Alveolar-capillary membrane interface
 - (D) Visceral pleura surface boundaries
- Q3.** An alkaloidal crude drug is evaluated using microscopic linear measurements. The average number of stomata per square millimeter of epidermis is counted, along with the total number of epidermal cells in the same area. What specific diagnostic index is represented by the formula $\frac{S}{E+S} \times 100$?
- (A) Stomatal Frequency
 - (B) Vein-Islet Number
 - (C) Stomatal Index
 - (D) Veinlet Termination Number
- Q4.** A sample of a polysaccharide isolated from a plant exudate is heated with dilute hydrochloric acid, neutralised, and then treated with Fehling's solution. A brick-red precipitate forms immediately. This analytical outcome confirms the primary presence of which functional biomolecules?
- (A) Non-reducing structural proteins
 - (B) Reducing monosaccharide components
 - (C) Saturated fat molecules
 - (D) High molecular weight structural lipids
- Q5.** Under the National Health Programs of India, which strategy is primarily deployed for the absolute elimination of Lymphatic Filariasis in endemic districts?



- (A) Continuous targeted active case detection through sputum microscopy
- (B) Annual Mass Drug Administration (MDA) using Diethylcarbamazine (DEC) and Albendazole
- (C) Implementation of standard Multi-Drug Therapy (MDT) for 12 months
- (D) Routine vaccination with the Bacillus Calmette–Guérin (BCG) vaccine
- (E) Pulse immunization campaigns using monovalent oral vaccines

Q6. The diagram below shows the key chemical pathways involved in the metabolic breakdown of a primary macronutrient. Which process is represented by Pathway II, where pyruvate is converted to lactate under specific cellular conditions?



- (A) Aerobic Citric Acid Cycle Oxidation
 - (B) Glycogen Degradation Cascade
 - (C) Anaerobic Glycolytic Reduction
 - (D) Oxidative Pentose Phosphate Pathway
- Q7.** A community pharmacist is reviewing inventory and wishes to optimize capital investment. The pharmacist uses a selective control technique where items are classified based on their annual consumption value, separating the high-value items requiring strict control from low-value ones. What is this method?
- (A) VED Analysis (Vital, Essential, Desirable)
 - (B) ABC Analysis (Always Better Control)
 - (C) FSN Analysis (Fast, Slow, Non-moving)
 - (D) EOQ Mathematical Optimization Model



- Q8.** According to the Drugs and Cosmetics Act, 1940 and Rules thereunder, life periods of antibiotics, vitamins, and biological products along with their storage conditions are governed under which specific schedule?
- (A) Schedule M
 - (B) Schedule P
 - (C) Schedule G
 - (D) Schedule Y
- Q9.** A clinical pharmacist observes that an intravenous infusion containing a specific basic drug forms a distinct crystalline precipitate when mixed with a highly buffered alkaline infusion fluid in a central line. This event is an example of which type of interaction?
- (A) Therapeutic synergy interaction
 - (B) Physical or chemical incompatibility
 - (C) Pharmacokinetic distribution displacement
 - (D) Enantiomeric biological inversion
- Q10.** A target structure contains a basic tertiary amine function and an aromatic ring. During structural modification to optimize central nervous system activity, the introduction of a highly polar carboxylic acid group will most likely lead to which change?
- (A) Marked increase in passive blood-brain barrier permeability
 - (B) Enhanced lipid membrane partition coefficient ($\log P$)
 - (C) Reduced central nervous system penetration due to decreased lipophilicity
 - (D) Absolute resistance to phase-II hepatic glucuronidation
- Q11.** An analytical chemist performs a limit test for iron using Thioglycolic acid. What is the precise functional role of thioglycolic acid in this standard compendial limit test?
- (A) To precipitate iron as an insoluble dark brown oxide complex



- (B) To reduce ferric iron (Fe^{3+}) to ferrous iron (Fe^{2+}) and form a stable pale pink to deep reddish-purple soluble coordination complex in an ammoniacal medium
- (C) To oxidize ferrous iron to ferric states for quantitative gravimetric sedimentation
- (D) To neutralize excess citric acid and provide a highly acidic buffer matrix

Q12. A patient presents to a hospital clinic with a diagnosis of open-angle glaucoma. The physician intends to lower intraocular pressure by topically administering a stable miotic drug that acts as a direct-acting muscarinic agonist resistant to rapid acetylcholinesterase hydrolysis. Which agent is most suitable?

- (A) Atropine sulfate
- (B) Pilocarpine hydrochloride
- (C) Physostigmine salicylate
- (D) Homatropine hydrobromide

Q13. A liquid pharmaceutical preparation is formulated by dispersing volatile oil components uniformly in an aqueous vehicle using a suitable surfactant. The final product appears as a clear, single-phase, thermodynamically stable system. This dosage form is classified as a:

- (A) Coarse flocculated suspension
- (B) Microemulsion or solubilized aromatic water
- (C) Unstable macroemulsion system
- (D) Flocculated non-aqueous paste

Q14. A validation engineer is evaluating a steam sterilization cycle in an autoclave for an aqueous parenteral solution. Which biological indicator should be used to confirm the definitive destruction of heat-resistant bacterial spores?

- (A) *Bacillus pumilus*
- (B) *Geobacillus stearothermophilus*



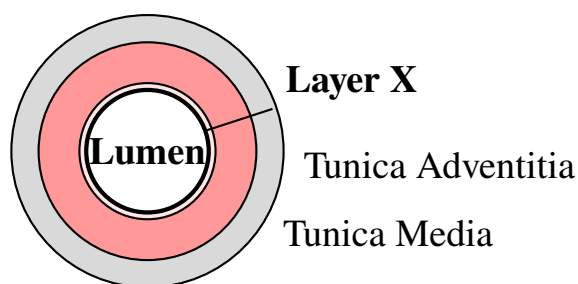
- (C) *Bacillus subtilis*
- (D) *Clostridium sporogenes*

- Q15.** During a clinical trial evaluating a novel anti-hypertensive drug, researchers measure changes in systemic vascular resistance. The drug acts as a competitive antagonist at peripheral vascular alpha-1 adrenergic receptors. What is the expected physiological effect of this agent?
- (A) Marked reflex bradycardia due to profound vasoconstriction
 - (B) Arteriolar and venular vasodilation resulting in a reduction of total peripheral resistance
 - (C) Direct positive inotropic activation of cardiac myocytes
 - (D) Selective constriction of renal and mesenteric vascular beds
- Q16.** A laboratory analyst prepares a standard buffer solution using a weak acid (HA) and its conjugate base (A^-). According to the Henderson-Hasselbalch equation, when the molar concentration of the conjugate base is exactly ten times the molar concentration of the un-ionized weak acid, what is the mathematical relationship between the pH of the system and the pKa of the acid?
- (A) $\text{pH} = \text{pKa} - 1$
 - (B) $\text{pH} = \text{pKa} + 1$
 - (C) $\text{pH} = \text{pKa} \times 10$
 - (D) $\text{pH} = \text{pKa}$
- Q17.** An organic chemist is analyzing the relative stability of two conformationally distinct geometric isomers of an alkene. The trans-isomer generally exhibits lower ground-state potential energy than the corresponding cis-isomer. This primary thermodynamic observation is best rationalized by which phenomenon?
- (A) Increased hyperconjugation pathways in the cis-isomer configuration
 - (B) Absence of steric hindrance between bulky alkyl groups in the trans-orientation



- (C) High net molecular dipole moments stabilizing the trans-conformation matrix
- (D) Enhanced angle strain within the carbon-carbon double bond of the trans-alkene

Q18. The physiological cross-sectional layout of a specific vascular structure is shown below. Identify the functional layer labeled Layer X, which is composed of a single sheet of flattened squamous cells that directly regulates vascular permeability and nitric oxide synthesis.



- (A) Stratified tunica adventitia fibroblast layer
 - (B) Tunica media smooth muscle monolayer
 - (C) Tunica intima endothelium
 - (D) Internal elastic lamina network
- Q19.** A compound contains an ester linkage that undergoes primary hydrolytic degradation in an aqueous environment. The rate of degradation increases significantly when the hydronium ion concentration of the solution is altered. This kinetic behavior is classified as:
- (A) Photolytic radical decomposition
 - (B) Specific acid or base catalysis
 - (C) Non-catalyzed thermal pyrolysis
 - (D) Anaerobic atmospheric reduction
- Q20.** A crude drug sample consisting of dried leaflets of *Cassia angustifolia* is treated with dilute hydrochloric acid, heated with ferric chloride solution, cooled, and extracted with an organic solvent like benzene. The organic layer is separated



and shaken with dilute ammonia solution. The ammoniacal layer develops a rose-pink color. This observation indicates the presence of:

- (A) Cyanogenetic glycosides
- (B) C-glycosides of anthraquinones
- (C) O-anthraquinone glycosides (Modified Born-trager's positive constituents)
- (D) Isoprenoid saponin fractions

Q21. A prescription requires the compounding of an emulsion. The pharmacist calculates the quantity of a surfactant blend required to achieve an HLB (Hydrophilic-Lipophilic Balance) value of 12.0 using Span 80 (HLB = 4.3) and Tween 80 (HLB = 15.0). If the total weight of the surfactant mixture is 10.0 g, what is the weight of Tween 80 needed?

- (A) 2.80 g
- (B) 7.20 g
- (C) 5.00 g
- (D) 4.30 g

Q22. According to the Pharmacy Act, 1948, the Pharmacy Council of India (PCI) is required to be reconstituted every five years. Who among the following is an ex-officio member of the Central Council of the PCI?

- (A) Six members elected by the University Grants Commission
- (B) The Director General of Health Services
- (C) One representative elected by the Medical Council of India
- (D) A registered pharmacist representing each individual state council

Q23. An enzyme follows Michaelis-Menten kinetics. If the substrate concentration $[S]$ is adjusted to be equal to exactly twice the value of the Michaelis constant (K_m), what will be the corresponding initial reaction velocity (v_0) expressed in terms of the maximum velocity (V_{max})?

- (A) $v_0 = \frac{1}{2}V_{max}$



(B) $v_0 = \frac{2}{3}V_{\max}$

(C) $v_0 = \frac{1}{3}V_{\max}$

(D) $v_0 = \frac{3}{4}V_{\max}$

Q24. A patient experiencing acute, severe substernal chest pain radiating to the left arm is administered sublingual nitroglycerin in an emergency department. What is the fundamental cellular mechanism of action of this organic nitrate?

(A) Inhibition of cardiac sodium-potassium ATPase pump

(B) Stimulation of soluble guanylyl cyclase, leading to increased intracellular cyclic GMP and vascular smooth muscle relaxation

(C) Competitive block of voltage-gated L-type calcium channels

(D) Direct antagonism of peripheral beta-1 adrenergic receptors

Q25. A pharmaceutical manufacturing batch records an unexpected change in product quality due to cross-contamination within a multi-product manufacturing facility. Which administrative regulatory document provides comprehensive framework guidelines to prevent such events through detailed design specifications for equipment and facilities?

(A) Good Laboratory Practices (GLP)

(B) Current Good Manufacturing Practices (cGMP) as per Schedule M

(C) Schedule V patent medicine guidelines

(D) ISO 9001 general documentation standards

Q26. A quantitative analysis requires the preparation of a 500 mL solution of 0.1 M Sodium Hydroxide ($NaOH$, Molecular Weight = 40). How many grams of pure sodium hydroxide pellets must be weighed and dissolved to achieve this specific concentration?

(A) 4.00 g

(B) 2.00 g

(C) 40.00 g



(D) 0.40 g

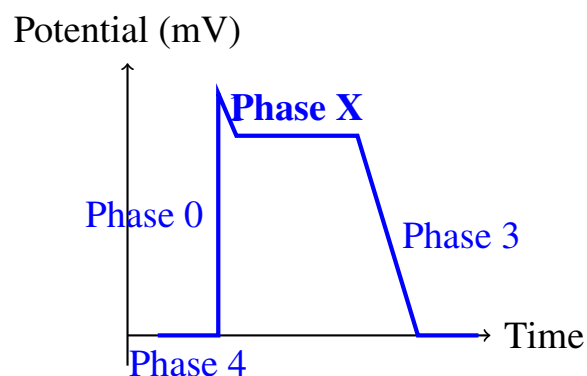
Q27. During a clinical safety review of a patient receiving long-term treatment with a high-dose aminoglycoside antibiotic, the clinician orders regular laboratory assessments of serum creatinine and audiometric profiles. This monitoring is primarily aimed at detecting early signs of which serious drug toxicities?

- (A) Severe hepatotoxicity and bone marrow suppression
- (B) Nephrotoxicity and irreversible ototoxicity
- (C) Acute hemolytic anemia and peripheral neuropathy
- (D) Pulmonary fibrosis and central seizures

Q28. A botanist classifies a collection of crude drugs according to their morphologic characteristics. Which of the following crude drug entities represents an unorganized crude drug consisting of a dried latex exudate?

- (A) Cinchona bark segments
- (B) Digitalis dried leaves
- (C) Opium poppy exudate
- (D) Fennel schizocarpic fruits

Q29. The graphical plot below shows the changes in transmembrane potential during a typical cardiac action potential in a ventricular myocyte. Which phase is characterized by a prolonged plateau due to the balanced influx of calcium ions via L-type channels and efflux of potassium ions?



- (A) Phase 0 rapid depolarization phase



- (B) Phase 1 brief early repolarization notch
- (C) Phase X (Phase 2 plateau stage)
- (D) Phase 3 rapid terminal repolarization

Q30. A patient is admitted to an emergency room presenting with profound respiratory depression, miosis, and extreme bradycardia due to an accidental overdose of a potent Narcotic Analgesic. Which therapeutic agent must be administered immediately as a specific antidote to reverse these life-threatening manifestations?

- (A) Flumazenil
- (B) Naloxone hydrochloride
- (C) Atropine sulfate
- (D) Pralidoxime chloride

Q31. A processing technician notes that a crystalline drug powder exhibits poor flow properties and high interparticulate friction, making direct compression into tablets impossible. To quantify the flowability and compressibility of this material before granulation, the technician computes Carr's Compressibility Index using bulk density and tapped density measurements. A value of 35% for Carr's index indicates that the powder flow is:

- (A) Excellent and highly free-flowing
- (B) Good and acceptable for high-speed tableting
- (C) Very poor and highly cohesive
- (D) Fair and manageable without glidants

Q32. A patient is diagnosed with an endocrine disorder characterized by polyuria, polydipsia, and an absolute deficiency in the synthesis of an octapeptide hormone stored and released from the posterior pituitary gland. This clinical profile describes a lack of which hormone?

- (A) Oxytocin
- (B) Vasopressin (Antidiuretic Hormone)



- (C) Growth Hormone
- (D) Adrenocorticotrophic Hormone

Q33. A pharmaceutical product is distributed to retail pharmacies with a clear instruction on the label: "Warning: To be sold by retail on the prescription of a Registered Medical Practitioner only." This product contains a drug that falls under which schedule of the Drugs and Cosmetics Rules?

- (A) Schedule X
- (B) Schedule H
- (C) Schedule G
- (D) Schedule P

Q34. During a routine inspection of a hospital pharmacy store, the supervisor checks the temperature records of the walk-in refrigerator. According to standard pharmacopoeial descriptions, what is the precise temperature range required for storage in a "Cold Place"?

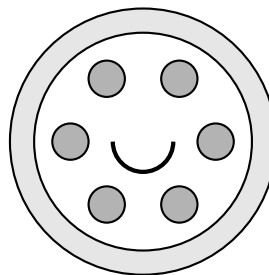
- (A) Between 2°C and 8°C
- (B) Between 8°C and 25°C
- (C) Exactly below 0°C
- (D) Between -10°C and -20°C

Q35. A 45-year-old patient who has recently undergone mechanical heart valve replacement requires chronic anticoagulant therapy. The clinical pharmacist conducts regular blood tests to monitor the Prothrombin Time expressed as an International Normalized Ratio (INR). This specific evaluation is a critical example of:

- (A) General public health screening
- (B) Clinical pharmacy monitoring for therapeutic efficacy and safety
- (C) Pre-formulation stability testing
- (D) Inventory control management



- Q36.** A laboratory chemist needs to confirm the structural identity of a purified organic compound containing an unbranched alkyl chain. The analyst uses an instrumental technique that measures the absorption of electromagnetic radiation, causing transitions between vibrational energy levels within covalent chemical bonds. What is this technique?
- (A) Ultraviolet-Visible Spectroscopy
(B) Infrared (IR) Spectroscopy
(C) Mass Spectrometry
(D) Nuclear Magnetic Resonance (NMR) Spectroscopy
- Q37.** The simplified schematic below depicts the operational structure of a mechanical system widely utilized in pharmaceutical unit operations to reduce the particle size of highly abrasive materials through interparticulate attrition and impact. Identify this milling equipment.



Rotating Vessel Containing Grinding Media

- (A) Hammer Mill
(B) Ball Mill
(C) Fluid Energy Mill
(D) Roller Mill
- Q38.** A clinical pharmacologist is comparing the pharmacokinetic profiles of two distinct formulations of an active drug molecule administered at identical oral doses. Formulation A displays an Area Under the Curve (AUC) that is twice as large as the AUC displayed by Formulation B. This finding directly implies that:
- (A) Formulation B has a faster rate of renal excretion than Formulation A.



- (B) Formulation A has a significantly higher extent of systemic bioavailability than Formulation B.
- (C) Formulation A undergoes extensive first-pass hepatic metabolism compared to Formulation B.
- (D) Formulation B has a larger volume of distribution than Formulation A.

Q39. A quality control chemist conducts a limit test for heavy metals on a batch of a newly synthesized inorganic chemical substance. The compendial test relies on the visual comparison of the color produced by reacting metallic impurities with hydrogen sulfide or sodium sulfide under precise pH conditions. The resulting visible appearance is due to the formation of:

- (A) Soluble bright yellow coordination complexes
- (B) Insoluble colloidal dispersions of metallic sulfides appearing as a brownish-black coloration
- (C) Crystalline white sulfate precipitates that settle rapidly
- (D) Gaseous elemental compounds that effervesce from the solution

Q40. A crude drug sample consisting of the dried unexpanded flower buds of *Eugenia caryophyllus* is evaluated for quality. A small section of the tissue is stained and observed under a microscope. The presence of numerous large, schizolysigenous oil cavities containing a volatile oil rich in eugenol is a characteristic feature of which drug?

- (A) Coriander fruit
- (B) Cinnamon bark
- (C) Clove buds
- (D) Senna leaflets

Q41. An organic molecule contains a carbon atom bonded to four different distinct structural groups or atoms. This specific structural feature creates a non-superimposable mirror image configuration. The asymmetric carbon atom is termed a:



- (A) Meso center
- (B) Chiral center
- (C) Geometrical isomer node
- (D) Allylic position

Q42. During a seminar on public health, an epidemiologist discusses methods to reduce the transmission of water-borne infectious diseases in rural areas. Which simple, highly cost-effective intervention provides the most widespread primary prevention against pathogens like *Vibrio cholerae*?

- (A) Widespread distribution of therapeutic broad-spectrum antibiotics
- (B) Disinfection of community drinking water sources via controlled chlorination
- (C) Routine administration of systemic anti-inflammatory drugs to all individuals
- (D) Construction of air purification systems in public spaces

Q43. A procurement manager in a hospital pharmacy is preparing a purchase order for essential life-saving drugs. To ensure clear contractual obligations, the manager specifies the exact terms of delivery, transport insurance, and point of transfer of title. This administrative process is an element of:

- (A) Clinical diagnostic programming
- (B) Purchasing and procurement management
- (C) Patient counseling and compliance monitoring
- (D) Pharmacy Council structural organization

Q44. A patient is diagnosed with severe primary hypertension and is prescribed a drug that selectively blocks peripheral beta-1 adrenergic receptors without causing significant partial agonist activity or membrane-stabilizing effects. Which drug fits this clinical description?

- (A) Propranolol hydrochloride
- (B) Atenolol



- (C) Phentolamine mesylate
- (D) Isoproterenol hydrochloride

Q45. A standard biochemical laboratory test is performed on a patient's blood sample to evaluate hepatic synthetic capacity. The total concentration of serum proteins, particularly albumin, is found to be significantly lower than the reference physiological range. This state of hypoalbuminemia is commonly associated with:

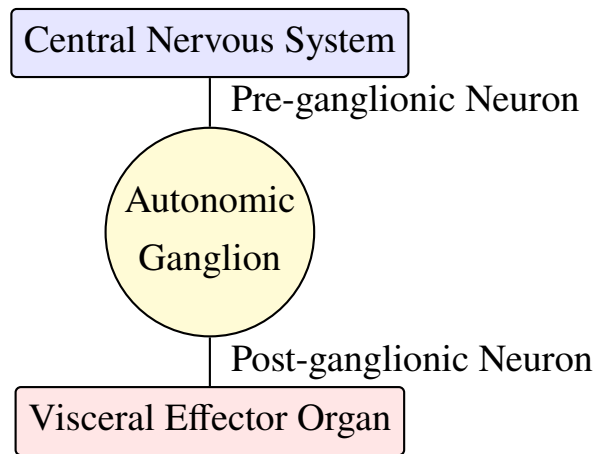
- (A) Advanced chronic hepatic cirrhosis or severe protein malnutrition
- (B) Acute bacterial infection of the upper respiratory tract
- (C) Early stage localized skeletal muscle trauma
- (D) Hypersecretion of the parathyroid gland

Q46. A clinical researcher is evaluating a new drug that acts as a potent irreversible inhibitor of the enzyme cyclooxygenase-1 (COX-1) within blood platelets. The principal physiological consequence of administering this drug will be the profound suppression of the synthesis of which mediator?

- (A) Thromboxane A₂, leading to an inhibition of platelet aggregation
- (B) Leukotriene B₄, causing bronchoconstriction
- (C) Interleukin-2, suppressing T-cell proliferation
- (D) Histamine, reducing local capillary permeability

Q47. The structural block diagram below illustrates the hierarchical flow of signals within a primary division of the human nervous system that coordinates involuntary homeostatic visceral activities. Identify the system represented.





- (A) Somatic Motor Nervous System
- (B) Autonomic Nervous System
- (C) Voluntary Musculoskeletal Arc
- (D) Special Sensory Affection Pathway

Q48. A wholesale drug distributor is preparing to apply for a license to sell, stock, or exhibit for sale or distribute drugs specified in Schedules C, C1, and X. According to the Drugs and Cosmetics Rules, which statutory forms must be filled and submitted by the applicant to the Licensing Authority?

- (A) Form 19 and Form 19C
- (B) Form 24 and Form 25
- (C) Form 18 and Form 18A
- (D) Form 12 and Form 13

Q49. A formulation scientist compiles a master formula for an antacid suspension. The formula requires the addition of an agent that increases the viscosity of the vehicle, thereby reducing the sedimentation rate of the deflocculated dispersed particles. Which substance serves this purpose?

- (A) Sodium chloride
- (B) Methylcellulose or Sodium carboxymethylcellulose
- (C) Polysorbate 80
- (D) Lactose monohydrate



- Q50.** A pharmacognocist receives a sample of a commercial bark drug for authentication. Microscopic inspection of a transverse section reveals the absolute absence of cork cells, indicating that the bark has been stripped of its outer layers during processing. This commercial form is described as:
- (A) Quill bark form
 - (B) Scraped or peeled bark
 - (C) Compound channel bark
 - (D) Flat unpeeled bark
- Q51.** A prescription written for a geriatric patient contains the Latin term "ter in die" abbreviated as "t.i.d.". What is the correct translation and operational instruction for administering this medication?
- (A) To be taken once every alternating day
 - (B) To be taken three times a day
 - (C) To be taken immediately in an emergency
 - (D) To be taken every evening before sleeping
- Q52.** During a public health campaign focused on family welfare and population control, the clinical pharmacist counsels a couple on temporary contraceptive options. The pharmacist highlights that a specific method not only prevents conception by forming a mechanical barrier but also offers significant secondary protection against Sexually Transmitted Infections (STIs). What is this method?
- (A) Oral combined contraceptive pills
 - (B) Intrauterine devices (IUDs)
 - (C) Male or female latex condoms
 - (D) Subcutaneous progestin implants
- Q53.** A compounding pharmacist is preparing an isotonic nasal spray containing an active medicinal agent. The pharmacist uses the freezing point depression method to adjust tonicity. An aqueous solution is considered isotonic with



physiological fluids like blood plasma and lacrimal secretion when its freezing point depression (ΔT_f) is equal to:

- (A) 0.00°C
- (B) -0.52°C
- (C) -1.20°C
- (D) $+0.52^\circ\text{C}$

Q54. An organic chemistry student is studying the mechanism of nucleophilic substitution reactions. When a tertiary alkyl halide is reacted with a weak nucleophile in a polar protic solvent, the reaction rate depends solely on the concentration of the alkyl halide, proceeding via a stable carbocation intermediate. This pathway is classified as:

- (A) Bimolecular Nucleophilic Substitution (S_N2)
- (B) Unimolecular Nucleophilic Substitution (S_N1)
- (C) Electrophilic Addition (Ad_E)
- (D) Free Radical Substitution (S_R)

Q55. A hospital pharmacist is managing the main medicine storage depot. To prevent degradation of moisture-sensitive chemical substances, the pharmacist installs heavy-duty dehumidifiers and stores the inventory in tightly sealed containers. This specialized environment is designed to prevent which degradation pathway?

- (A) Hydrolysis
- (B) Photolysis
- (C) Polymerization
- (D) Isomerization

Q56. A patient presents with symptoms of extreme fatigue, pale skin, and shortness of breath. A complete blood count reveals a low hemoglobin concentration and a reduced hematocrit, indicating anemia. The primary organ system responsible



for transporting oxygen bound to hemoglobin within red blood cells throughout the systemic circulation is the:

- (A) Lymphatic System
- (B) Cardiovascular System
- (C) Integumentary System
- (D) Digestive System

Q57. During an audit of a hospital pharmacy ward, the clinical inspector reviews the operating protocols for patient counseling. The primary goal of providing comprehensive verbal and written patient counseling at the time of medication dispensing is to:

- (A) Maximize the financial profit margins of the retail pharmacy outlet
- (B) Replace the primary diagnostic role of the treating physician
- (C) Enhance patient adherence to the prescribed drug regimen and minimize medication errors
- (D) Disregard legal liability frameworks established under schedule drug protocols

Q58. A quantitative biochemical assay is conducted to evaluate a patient's lipid profile. The laboratory technician measures the concentrations of total cholesterol, triglycerides, High-Density Lipoproteins (HDL), and Low-Density Lipoproteins (LDL). A high plasma concentration of which lipid component is independently associated with a reduced risk of atherogenesis?

- (A) Low-Density Lipoprotein (LDL)
- (B) Very Low-Density Lipoprotein (VLDL)
- (C) High-Density Lipoprotein (HDL)
- (D) Chylomicron remnants

Q59. A forensic toxicologist is examining a biological sample from an individual suspected of being under the influence of a controlled substance. The substance is known to induce severe physiological dependence, tolerance, and high abuse



liability, and its illicit possession is heavily penalized under national criminal frameworks. Which statutory law regulates these substances?

- (A) The Pharmacy Act, 1948
- (B) The Poisons Act, 1919
- (C) The Narcotic Drugs and Psychotropic Substances (NDPS) Act, 1985
- (D) The Drugs and Magic Remedies (Objectionable Advertisements) Act, 1954

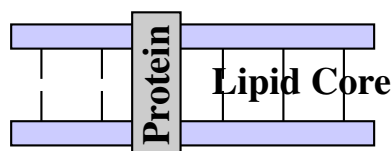
Q60. A clinical pharmacist in an oncology ward evaluates a prescription for a patient receiving high-dose methotrexate therapy. The pharmacist recommends the co-administration of leucovorin (folinic acid) precisely to rescue normal host cells from which induced functional deficiency?

- (A) Pyridoxine deficiency due to enzymatic inactivation
- (B) Tetrahydrofolate depletion caused by the inhibition of dihydrofolate reductase
- (C) Direct competitive antagonism of vitamin B12 absorption
- (D) Irreversible destruction of systemic ascorbic acid pools

Q61. A manufacturing engineer is designing a solid dosage form production line and needs to separate coarse granules from fine powder particles after a wet granulation step. Which unit operation equipment relies on a horizontal oscillatory motion across a calibrated mesh screen to achieve size separation?

- (A) Cyclone Separator
- (B) Sieve Shaker or Oscillating Granulator
- (C) Fluidized Bed Dryer Air Stream
- (D) Double Cone Blender Vessel

Q62. An advanced structural diagram of a biological interface is illustrated below. Identify the model that defines this amphipathic lipid bilayer matrix interspersed with integral and peripheral functional proteins.



- (A) Unit Membrane Rigid Matrix Concept
- (B) Fluid Mosaic Model of the Plasma Membrane
- (C) Micellar Solid Aggregate Topology
- (D) Liposomal Spherical Concentric Array

Q63. A crude drug pharmacognosic monograph describes an organized plant structure containing characteristic non-glandular uniseriate trichomes, anomocytic stomata, and calcium oxalate rosette crystals. This description aligns with which medicinal leaf drug?

- (A) *Digitalis purpurea* *Atropa belladonna*
- (B) *Senna alexandrina*
- (C) *Mentha piperita*

Q64. A quality control team samples an anhydrous chemical raw material to verify its purity using a physical constant. The team measures the temperature at which the solid phase transitions completely into a clear liquid phase under standard atmospheric pressure. This physical parameter is the:

- (A) Boiling point elevation profile
- (B) Specific optical rotation angle
- (C) Melting point configuration
- (D) Refractive index boundary

Q65. A clinical safety profile of a patient receiving chronic therapy with a non-selective monoamine oxidase (MAO) inhibitor reveals an episode of acute hypertensive crisis after consuming tyramine-rich fermented food. This adverse interaction is a classical example of:

- (A) Direct physical adsorption incompatibility
- (B) Pharmacodynamic food-drug interaction (the "cheese reaction")
- (C) Pharmaceutical formulation decomposition
- (D) Accelerated renal clearance induction



- Q66.** During a laboratory practical in anatomy and physiology, a student examines a histological slide of human skeletal tissue. The specimen exhibits concentric structural rings termed lamellae surrounding a central canal that houses blood vessels and nerve fibers. This morphology is characteristic of:
- (A) Hyaline cartilage matrix
 - (B) Compact bone (Osteon or Haversian system)
 - (C) Dense irregular fibrous connective tissue
 - (D) Smooth muscle visceral syncytium
- Q67.** A patient presents with a prescription for an Over-The-Counter (OTC) medication to relieve mild tension headache. While dispensing the medication, the community pharmacist reviews safety guidelines. Which core parameter defines a medication as an OTC drug?
- (A) It can only be dispensed in a state-run institutional hospital pharmacy.
 - (B) It is legally permitted to be sold consumer-direct without requiring a prescription from a registered medical practitioner.
 - (C) It requires mandatory intravenous clinical monitoring during administration.
 - (D) It contains a highly potent narcotic substance regulated under international embargoes.
- Q68.** A biochemical analysis of an isolated protein structure demonstrates that the polypeptide chain is folded into a stable configuration stabilized primarily by hydrogen bonds between the carbonyl oxygen and amide hydrogen atoms of the peptide backbone. This level of structural organization is known as the:
- (A) Primary amino acid sequence orientation
 - (B) Secondary structure (α -helix or β -pleated sheet)
 - (C) Tertiary three-dimensional monomeric folding
 - (D) Quaternary multi-subunit assembly
- Q69.** A clinical pharmacist in a hospital setting evaluates a medication order for an elderly patient with impaired renal clearance. The patient is prescribed a standard



adult dose of a potent cardiac glycoside. What action should the pharmacist take to minimize the risk of cumulative digitalis toxicity?

- (A) Increase the dose to achieve faster steady-state therapeutic concentrations.
- (B) Suggest an adjusted lower maintenance dose based on calculated creatinine clearance values.
- (C) Switch the route of administration to rapid intravenous bolus injections.
- (D) Administer the medication alongside a high-dose calcium infusion.

Q70. According to the structural rules of organic nomenclature, what is the IUPAC name of the compound represented by the chemical formula $\text{CH}_3 - \text{CH}(\text{OH}) - \text{CH}_2 - \text{CH}_3$?

- (A) Butan-1-ol
- (B) Butan-2-ol
- (C) Propan-2-ol
- (D) 2-Methylpropan-1-ol

Q71. During an evaluation of a crude drug sample, a pharmacognosic specialist detects the deliberate addition of low-grade exhausted vegetable material that visually resembles the genuine drug. This fraudulent practice is classified as:

- (A) Intentional adulteration using exhausted drug material
- (B) Accidental microbial contamination
- (C) Natural geographical variation
- (D) Cultivation optimization divergence

Q72. A clinical case study of a patient presenting with an overproduction of thyroid hormones due to an autoimmune disorder (Graves' disease) notes a state of hypermetabolism. The primary organ system that synthesizes thyroxine (T_4) and triiodothyronine (T_3) to regulate systemic basal metabolic rate is the:

- (A) Exocrine Pancreatic System
- (B) Endocrine System



- (C) Integumentary Matrix System
- (D) Musculoskeletal Motor System

Q73. A pharmacy student is preparing a study guide on the history of pharmaceutical legislation in India. The report notes that the government appointed a specific committee in 1930 to investigate the quality of imported drugs and recommend measures to regulate pharmacy education and practice. This committee is known as the:

- (A) Bhore Committee
- (B) Chopra Committee (Drugs Enquiry Committee)
- (C) Hathi Committee
- (D) Mudaliar Committee

Q74. A manufacturing facility produces a large volume of sterile Water for Injection (WFI). According to regulatory standards, which distillation apparatus design is optimized to remove volatile and non-volatile impurities along with pyrogenic bacterial endotoxins?

- (A) Simple glass flask distillation unit
- (B) Multi-effect distillation still matching compendial parameters
- (C) Fluidized bed evaporation chamber
- (D) Open-surface solar evaporation pan

Q75. A patient with a documented history of severe seasonal allergic rhinitis is prescribed a second-generation H₁-antihistamine. The primary advantage of choosing a second-generation agent like cetirizine or loratadine over a first-generation agent like diphenhydramine is:

- (A) Enhanced passive diffusion across the blood-brain barrier
- (B) Minimal central nervous system penetration, resulting in significantly lower sedation liability
- (C) Direct irreversible antagonism of peripheral beta-2 receptors



(D) Complete avoidance of hepatic first-pass structural clearance

Q76. A quality control chemist performs a limit test for arsenic using the standard Gutzeit apparatus. The chemical test relies on the liberation of arsenious gas (AsH_3), which reacts with a sensitized paper indicator to form a distinct colored stain. What chemical agent is used to sensitize the test paper?

(A) Barium chloride solution

(B) Mercuric chloride paper

(C) Silver nitrate solution

(D) Lead acetate solution

Q77. A collection of dried roots of *Rauwolfia serpentina* is evaluated for alkaloidal content. The therapeutic activity of this crude drug is primarily attributed to which indole alkaloid molecule, widely utilized for its antipsychotic and antihypertensive properties?

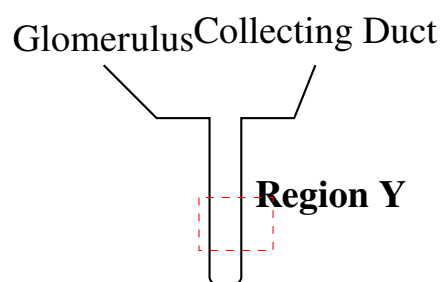
(A) Quinine

(B) Reserpine

(C) Strychnine

(D) Atropine

Q78. The structural schematic below shows the primary operational sections of a typical mammalian nephron. Identify the region labeled Region Y, where active sodium reabsorption occurs without parallel water transport, making it a key site of action for loop diuretics.



(A) Proximal Convoluted Tubule



- (B) Thick Ascending Limb of the Loop of Henle
- (C) Descending Thin Limb Segment
- (D) Distal Papillary Collecting Duct Interface

Q79. An organic chemist performs an electrophilic aromatic substitution reaction by reacting benzene with a mixture of concentrated nitric acid and concentrated sulfuric acid. The primary reactive intermediate that attacks the aromatic ring during this nitration reaction is the:

- (A) Nitrite anion (NO_2^-)
- (B) Nitronium ion (NO_2^+)
- (C) Nitrate radical (NO_3^\bullet)
- (D) Nitrogen dioxide neutral molecule (NO_2)

Q80. A public health official analyses epidemiological data regarding an ongoing national health program aimed at controlling vector-borne viral illnesses like Dengue and Chikungunya. The primary environmental focus of these preventive strategies is centered upon:

- (A) Eradication of wild rodent vector populations near food grain stores
- (B) Elimination of stagnant water breeding sites for *Aedes* mosquitoes
- (C) Universal pasteurization of commercial dairy products
- (D) High-temperature incineration of clinical solid wastes

Q81. A pharmaceutical procurement officer utilizes an administrative system where inventory replenishment is triggered automatically when the stock level falls to a predefined numerical threshold. This threshold, calculated based on lead time and average consumption rate, is known as the:

- (A) Reorder Point (ROP)
- (B) Maximum Stock Buffer Level
- (C) Economic Safety Margin
- (D) Dead Stock Valuation Index



- Q82.** According to the provisions of the Narcotic Drugs and Psychotropic Substances Act, 1985, which statutory officer is authorized to issue licenses for the cultivation of the opium poppy within designated geographical zones?
- (A) The State Pharmacy Council President
 - (B) The Narcotics Commissioner appointed by the Central Government
 - (C) The local Municipal Corporation Chief Officer
 - (D) The Drugs Controller General of India
- Q83.** A clinical pharmacist reviews a medication chart for a patient diagnosed with type-2 diabetes mellitus who is prescribed an oral hypoglycemic agent that acts by activating peroxisome proliferator-activated receptor-gamma (PPAR- γ) to enhance peripheral insulin sensitivity. This drug belongs to which class?
- (A) Sulfonylureas
 - (B) Biguanides
 - (C) Thiazolidinediones (Glitazones)
 - (D) Alpha-glucosidase inhibitors
- Q84.** A formulation scientist is stabilizing a preparation containing an easily oxidizable drug. To minimize oxidative degradation, the scientist seals the container under an inert atmosphere. Which gas is typically used to displace atmospheric oxygen during the sealing of ampoules?
- (A) Carbon dioxide gas
 - (B) Pure Nitrogen gas
 - (C) Compressed atmospheric air
 - (D) Nitrous oxide gas
- Q85.** During a clinical laboratory evaluation, a sample of a patient's urine is mixed with Benedict's reagent and heated in a boiling water bath. The solution produces an intense brick-red precipitate. This diagnostic result indicates the presence of an abnormal concentration of which substance in the urine?



- (A) Conjugated bilirubin protein fractions
- (B) Reducing sugars, such as glucose (glucosuria)
- (C) High molecular weight albumin proteins
- (D) Acetoacetic acid ketone bodies

Q86. A patient presenting with symptoms of acute severe bronchospasm due to status asthmaticus is treated with an intravenous infusion of aminophylline. The principal cellular mechanism underlying the bronchodilatory action of this methylxanthine derivative involves:

- (A) Non-selective inhibition of phosphodiesterase (PDE) enzymes, leading to increased intracellular cyclic AMP levels
- (B) Direct competitive activation of muscarinic M3 receptors
- (C) Block of peripheral beta-2 adrenergic pathways
- (D) Inhibition of the synthesis of endogenous nitric oxide gas

Q87. A capsule manufacturing plant experiences a high rejection rate due to a defect where the two halves of the hard gelatin capsule shell separate during high-speed mechanical filling. This operational issue is most directly caused by:

- (A) Inadequate locking rim dimensions or incorrect moisture content of the shell
- (B) Excessively high concentration of titanium dioxide pigment
- (C) Inversion of the internal plasticizer-to-gelatin ratio
- (D) Use of low-bloom strength gelatin raw material

Q88. A team of field botanists is studying the commercial cultivation of medicinal plants. They observe that a specific plant species rich in cardiac glycosides yields a significantly higher concentration of secondary metabolites when harvested at a specific altitude during late afternoon sunshine. This observation emphasizes the critical importance of optimizing which parameter?

- (A) Artificial post-harvest chemical preservation techniques
- (B) Environmental cultivation and seasonal collection conditions



- (C) Adulteration classification matrices
- (D) Microscopic linear cell wall measurement indices

Q89. During an anatomy laboratory session, a medical student identifies a vascular structure that carries oxygen-depleted blood from the right ventricle of the heart directly to the respiratory tissue of the lungs for oxygenation. This vascular structure is the:

- (A) Systemic Dorsal Aorta
- (B) Pulmonary Artery
- (C) Superior Vena Cava
- (D) Pulmonary Vein

Q90. An organic chemist synthesizes a series of substituted carboxylic acids. The introduction of an electronegative chlorine atom at the alpha-carbon position significantly increases the acid strength of the molecule compared to the unsubstituted parent acid. This chemical phenomenon is governed by the:

- (A) Electron-donating resonance effect
- (B) Electron-withdrawing inductive effect ($-I$ effect)
- (C) Steric inhibition of hyperconjugation
- (D) Homolytic radical coupling mechanism

Q91. According to the National Health Programs in India, the Revised National Tuberculosis Control Programme (RNTBCP), currently integrated as the Nikshay Poshan Yojana/National TB Elimination Program, utilizes a primary therapeutic strategy involving short-course chemotherapy regimens under direct supervision. This operational program is known as:

- (A) MDT Protocol Management
- (B) DOTS (Directly Observed Treatment, Short-course)
- (C) Pulse Campaign Mobilization
- (D) Integrated Vector Surveillance (IVS)



- Q92.** A hospital pharmacist in charge of the sterile central supply department evaluates the layout of a cleanroom used for aseptic compounding. To maintain a sterile environment, the air inside the cleanroom is continually filtered through High-Efficiency Particulate Air (HEPA) filters. What is the minimum efficiency specification required for a standard HEPA filter?
- (A) 99.97% efficiency in removing airborne particles down to a size of $0.3 \mu\text{m}$
 - (B) 90.00% efficiency in removing airborne particles down to a size of $5.0 \mu\text{m}$
 - (C) 75.50% efficiency in removing airborne particles down to a size of $10.0 \mu\text{m}$
 - (D) 95.00% efficiency in removing airborne particles down to a size of $1.5 \mu\text{m}$
- Q93.** A patient presenting with symptoms of a severe systemic deep-tissue fungal infection is prescribed an intravenous polyene antibiotic. During the clinical infusion, the pharmacist monitors the patient's serum electrolytes and renal function markers closely due to the high incidence of nephrotoxicity associated with this agent. Which drug is being administered?
- (A) Penicillin G sodium
 - (B) Amphotericin B
 - (C) Griseofulvin
 - (D) Ciprofloxacin hydrochloride
- Q94.** A quality control analyst conducts a quantitative titration of a weak acid sample using a standardized strong base solution. To observe the exact equivalence point visually, the analyst chooses an organic dye indicator that transitions from colorless to pink within a distinct alkaline pH range. This indicator is:
- (A) Methyl orange
 - (B) Phenolphthalein
 - (C) Bromocresol green
 - (D) Thymol blue in strongly acidic media
- Q95.** A pharmacognocist extracts a sample of a crude drug derived from the dried bark of *Cinchona calisaya*. The extracted alkaloidal fraction is treated with



dilute sulfuric acid, which produces a vivid blue fluorescence. The subsequent addition of bromine water followed by ammonia solution yields a characteristic emerald green precipitate. This analytical outcome confirms the presence of:

- (A) Tropane alkaloid derivatives
- (B) Quinoline alkaloids, specifically quinine (Thalleioquin test positive)
- (C) Purine bases like caffeine
- (D) Isoquinoline fractions like morphine

Q96. During a structural physiology workshop, a student examines a model of the human digestive tract. The anatomical region characterized by a highly folded mucosal layer forming finger-like projections termed villi, which maximize the surface area available for nutrient absorption, is the:

- (A) Esophageal muscular tube
- (B) Fundus region of the stomach
- (C) Small Intestine (Duodenum, Jejunum, and Ileum)
- (D) Descending Colon segment

Q97. An organic chemist is analyzing the reactivity of an unsymmetrical alkene towards electrophilic addition. When hydrogen bromide (HBr) is reacted with propene in the absolute absence of peroxides, the hydrogen atom attaches preferentially to the carbon atom with the greater number of hydrogen atoms, yielding 2-bromopropane as the major product. This regioselective outcome is predicted by:

- (A) Hückel's Rule of Aromaticity
- (B) Markovnikov's Rule
- (C) Anti-Markovnikov Peroxide Effect
- (D) Hofmann Elimination Criteria

Q98. A community health pharmacist conducts a workshop on family welfare and immunization. The pharmacist explains that active immunity is artificially induced in a population by introducing attenuated or inactivated pathogens that



stimulate the host immune system to produce specific memory antibodies. This public health intervention describes the action of:

- (A) Intravenous immunoglobulin infusions
- (B) Broad-spectrum prophylactic antiviral drugs
- (C) Vaccines
- (D) Systemic corticosteroid agents

Q99. A hospital pharmacy supervisor reviews the annual financial statements of the department. The supervisor notes that the total value of items currently held in storage represents a significant portion of locked-up capital. To optimize cash flow, the supervisor recommends reducing the turnaround time between order placement and inventory use, an administrative strategy belonging to:

- (A) Clinical diagnostic programming
- (B) Store and inventory control management
- (C) Patient counselling protocol verification
- (D) Forensic toxicology reporting frameworks

Q100. According to the Drugs and Cosmetics Act, 1940, any drug configuration that is labeled with a name belonging to another drug entity, or that substantiates an absolute substitution of one active drug element with another unauthorized chemical entity, is legally classified as a:

- (A) Misbranded drug
- (B) Spurious drug
- (C) Adulterated compendial formulation
- (D) Intellectual patent drug



Detailed Solutions**Q1.****Solution****Concept:**

Pharmaceutical formulation stability depends closely on choosing packaging and storage conditions that prevent exposure to environmental degradants. Volatile active components are prone to evaporative mass loss and atmospheric oxygen-driven oxidative degradation. Using tightly closed, well-filled amber glass containers provides a physical barrier against gas exchange, minimizes the headspace volume containing residual oxygen, and screens out actinic light wavelengths that catalyze auto-oxidation.

Solution:

- (a) Volatile liquids exert high vapor pressures, meaning they evaporate easily if stored in open or poorly sealed containers. Airtight structural closures prevent the loss of therapeutic vapors.
- (b) Oxidation kinetics are driven by exposure to atmospheric oxygen. Keeping containers well-filled decreases the internal gaseous headspace, minimizing the moles of oxygen available to interact with the formulation matrix.
- (c) Amber glass acts as an effective filter against ultraviolet and short-wavelength visible light. Light energy frequently acts as a catalyst, providing activation energy for radical-mediated oxidative cascades.
- (d) Cool temperature storage conditions mathematically reduce the kinetic energy of the molecules, significantly slowing down both the rate of evaporation and the velocity of chemical degradation pathways.
- (e) Plastics like polyvinyl chloride or polystyrene can exhibit gas permeability, sorption phenomena, or leaching of plasticizers, making high-quality compendial glass the superior choice for volatile and volatile-sensitive preparations.

Final Answer: Store in a well-filled, tightly closed amber glass container with an airtight seal in a cool place.

Answer: (B)

[Go Back to Question 1](#)



Q2.

Solution**Concept:**

External respiration relies on passive gas exchange across the blood-air barrier, driven entirely by partial pressure gradients. The respiratory membrane represents the anatomical junction where the alveolar wall meets the capillary endothelium. It is optimized for gas exchange by possessing an extremely large surface area and an ultra-thin cross-section, allowing oxygen to diffuse rapidly down its concentration gradient into the systemic blood.

Solution:

- (a) Air entering the alveoli contains a high partial pressure of oxygen, whereas deoxygenated blood arriving via the pulmonary arterial circuit has a low oxygen tension. This sets up a steep partial pressure gradient.
- (b) The structural pathway for diffusion consists of the alveolar squamous epithelium, an extracellular basement membrane, and the endothelial wall of the pulmonary capillary.
- (c) The diagram depicts this exact anatomical interface, labeling it as the diffusion pathway. This microscopic barrier measures less than one micrometer in thickness, minimizing physiological resistance to gas transit.
- (d) Large conducting airways, such as the trachea and bronchi, contain thick cartilage rings and lack the microvascular networks necessary to support gas exchange.
- (e) Terminal bronchioles serve primarily as air conduction pathways and contain smooth muscle networks that control airway resistance, rather than acting as primary diffusion surfaces.

Final Answer: Alveolar-capillary membrane interface.

Answer: (C)

[Go Back to Question 2](#)



Q3.

Solution**Concept:**

Quantitative microscopy serves as a valuable tool for authenticating crude vegetable drugs and identifying adulteration. Numerical leaf indices, including stomatal frequency, stomatal index, vein-islet numbers, and palisade ratios, remain constant within a given plant species regardless of environmental growth conditions or geographic origin, making them highly reliable diagnostic markers.

Solution:

- (a) Stomata are specialized microscopic pores located on the epidermal layer of leaves that regulate gas exchange and transpiration.
- (b) The absolute number of stomata per unit area can vary significantly based on environmental parameters such as moisture levels, soil quality, and sunlight exposure.
- (c) The stomatal index represents the percentage proportion that the total number of stomata bears to the total number of epidermal cells plus stomata within a designated field.
- (d) Mathematically, this relationship is defined by the standard compendial formula: Stomatal Index = $[S/(E + S)] \times 100$, where S equals the number of stomata and E equals the number of epidermal cells.
- (e) Because this index calculates a relative ratio rather than an absolute count, it remains statistically uniform for a given plant species and is widely used to distinguish genuine crude drugs from closely related substitutes.

Final Answer: Stomatal Index.

Answer: (C)

[Go Back to Question 3](#)



Q4.

Solution**Concept:**

Qualitative chemical tests allow researchers to deduce the structural composition of complex natural polysaccharides. Acid-catalyzed hydrolysis cleaves the glycosidic linkages holding a polysaccharide chain together, releasing its constituent monosaccharide units. If these monomers possess free, unlinked aldehyde or ketone functional groups, they can reduce copper ions in an alkaline solution, generating a visible color change.

Solution:

- (a) Heating a complex plant polysaccharide with dilute hydrochloric acid breaks the high molecular weight polymer down into its basic monomeric building blocks.
- (b) Neutralization is required because the subsequent analytical reagent contains strong alkali components that cannot function optimally in an acidic environment.
- (c) Fehling's reagent consists of a freshly prepared mixture of copper sulfate solution and alkaline sodium potassium tartrate (Rochelle salt).
- (d) Reducing sugars contain free or potentially free carbonyl groups that transfer electrons to cupric ions (Cu^{2+}), reducing them to insoluble cuprous oxide (Cu_2O).
- (e) The formation of an insoluble brick-red precipitate confirms the presence of reducing monosaccharides, indicating that the original polymer was composed of reducing sugar subunits.

Final Answer: Reducing monosaccharide components.

Answer: (B)

[Go Back to Question 4](#)



Q5.

Solution**Concept:**

Public health elimination programs utilize targeted population-wide chemoprevention to disrupt the transmission cycles of vector-borne infectious diseases. Lymphatic filariasis, caused by parasitic filarial worms and transmitted by mosquitoes, is targeted through public health interventions designed to rapidly lower the microfilarial load across entire communities.

Solution:

- (a) Mass Drug Administration (MDA) involves treating an entire eligible population in a defined endemic geographic area with a single dose of antifilarial medications simultaneously.
- (b) The standard drug combination deployed under India's national guidelines consists of co-administering diethylcarbamazine (DEC) and albendazole annually.
- (c) Diethylcarbamazine acts by altering microfilarial membranes and inducing phagocytosis, which rapidly clears the immature microfilariae from the patient's bloodstream.
- (d) Albendazole exerts an anthelmintic effect by inhibiting microtubule polymerisation within the parasite, while also targeting co-enduring intestinal helminth infections.
- (e) This public health strategy effectively prevents local mosquito populations from acquiring microfilariae during a blood meal, breaking the transmission chain to achieve disease eradication.

Final Answer: Annual Mass Drug Administration (MDA) using Diethylcarbamazine (DEC) and Albendazole.

Answer: (B)

[Go Back to Question 5](#)



Q6.

Solution**Concept:**

Cellular respiration switches between metabolic pathways based on the availability of molecular oxygen. Glycolysis breaks down a six-carbon glucose molecule into two molecules of three-carbon pyruvate. Under hypoxic conditions or in cells lacking mitochondria, pyruvate undergoes anaerobic reduction to ensure that glycolysis can continue generating adenosine triphosphate (ATP).

Solution:

- (a) Pathway I represents general glycolysis, an absolute metabolic process that converts glucose to pyruvate within the cytoplasm while generating a net yield of two ATP molecules.
- (b) Pathway III describes the aerobic fate of pyruvate, where it undergoes oxidative decarboxylation inside the mitochondria to form acetyl-coenzyme A for entry into the citric acid cycle.
- (c) Pathway II represents anaerobic glycolysis, where pyruvate is reduced directly to lactate by the cytosolic enzyme lactate dehydrogenase.
- (d) This reduction couples with the simultaneous oxidation of NADH back to NAD^+ . Restoring cellular pools of NAD^+ is vital to keep the glyceraldehyde-3-phosphate dehydrogenase step of glycolysis functional.
- (e) This anaerobic pathway is heavily utilized by skeletal muscles during high-intensity exercise and by mature red blood cells, which completely lack functional mitochondria.

Final Answer: Anaerobic Glycolytic Reduction.

Answer: (C)

[Go Back to Question 6](#)



Q7.

Solution**Concept:**

Effective inventory control techniques allow managers to distribute oversight resources efficiently based on the financial impact of different stock items. Classifying inventory items by their annual consumption value allows managers to apply rigorous administrative controls to the high-value items that account for the majority of the budget.

Solution:

- (a) ABC analysis is an application of Pareto's Principle, which states that a small percentage of inventory items typically represents the largest portion of total expenditures.
- (b) Class A items represent roughly 10% to 15% of total inventory quantities but account for approximately 70% to 80% of the annual consumption value, requiring tight control.
- (c) Class B items represent a moderate proportion of both physical quantity and value, requiring intermediate administrative oversight.
- (d) Class C items comprise the bulk of physical inventory stock (60% to 70%) but represent a small fraction of overall value (5% to 10%), requiring minimal management.
- (e) VED analysis classifies items based on criticality (Vital, Essential, Desirable), while FSN analysis focuses on turnover rate (Fast, Slow, Non-moving).

Final Answer: ABC Analysis (Always Better Control).

Answer: (B)

[Go Back to Question 7](#)



Q8.

Solution**Concept:**

The Drugs and Cosmetics Act of 1940 and its subsequent Rules establish legal schedules that dictate the manufacturing, labeling, prescription, and distribution standards for pharmaceutical products within India. These schedules ensure that sensitive biological and chemical materials are handled properly throughout their life cycle to preserve potency and safety.

Solution:

- (a) Schedule P sets forth the maximum periods of validity and life periods for various categories of drugs, specifically detailing how long an antibiotic or biological product remains stable.
- (b) This schedule also defines the storage temperatures and environmental conditions required to prevent premature degradation of these therapeutic substances.
- (c) Schedule M regulates current Good Manufacturing Practices (cGMP), outlining the infrastructural, equipment, and sanitation requirements for pharmaceutical manufacturing facilities.
- (d) Schedule G applies to medications that must be taken under close medical supervision, requiring a specific warning label to that effect.
- (e) Schedule Y establishes the framework guidelines, requirements, and protocols for conducting clinical trials and evaluating the safety of new drug approvals.

Final Answer: Schedule P.

Answer: (B)

[Go Back to Question 8](#)



Q9.

Solution**Concept:**

Pharmaceutical incompatibilities occur when mixing two or more medicinal substances produces an undesirable physical, chemical, or therapeutic outcome. Physical and chemical incompatibilities often manifest as visible changes, such as precipitation, color shifts, or phase separation, which can compromise drug efficacy and pose severe safety risks to the patient.

Solution:

- (a) A basic drug molecule exhibits high solubility in its ionized salt form within an acidic or neutral fluid matrix.
- (b) Exposing a weak base to an alkaline environment shifts the ionization equilibrium toward the un-ionized form according to the Henderson-Hasselbalch principle.
- (c) Un-ionized basic molecules possess lower aqueous solubility than their corresponding salts, causing them to precipitate out of the solution.
- (d) Crystalline precipitation within an intravenous line represents a physical and chemical incompatibility that can lead to catheter occlusion or dangerous microemboli if infused.
- (e) This phenomenon is separate from pharmacokinetic interactions, which involve shifts in drug absorption, distribution, metabolism, or excretion within the body.

Final Answer: Physical or chemical incompatibility.

Answer: (B)

[Go Back to Question 9](#)



Q10.

Solution**Concept:**

The central nervous system penetration of a drug molecule depends on its ability to cross the blood-brain barrier via passive transcellular diffusion. This physiological barrier consists of tight endothelial junctions that restrict the passage of highly polar or ionized chemical entities, making lipophilicity a key structural requirement for central activity.

Solution:

- (a) Introducing a carboxylic acid function (-COOH) adds a highly polar group that readily ionizes into a carboxylate anion at physiological pH.
- (b) This ionization significantly lowers the molecule's lipid membrane partition coefficient ($\log P$), increasing its relative hydrophilicity.
- (c) Lower lipophilicity limits the drug's ability to partition into and diffuse through the endothelial cell membranes of the brain capillaries.
- (d) Modifying a drug structure to add polar functional groups reduces its steady-state central nervous system concentration.
- (e) This approach is commonly used in medicinal chemistry to minimize central nervous system side effects, such as converting sedating first-generation antihistamines into non-sedating peripheral agents.

Final Answer: Reduced central nervous system penetration due to decreased lipophilicity.

Answer: (C)

[Go Back to Question 10](#)



Q11.

Solution**Concept:**

The compendial limit test for iron is a colorimetric assay designed to identify and restrict trace iron contamination in pharmaceutical materials. The method relies on generating a soluble, colored coordination complex under specific alkaline chemical conditions. The intensity of the resulting color is visually compared against a standard reference solution to ensure the test sample remains within permissible regulatory purity thresholds.

Solution:

- (a) Thioglycolic acid serves a dual functional role in this standard analytical limit test to guarantee uniform complexation.
- (b) It acts as a reducing agent that converts any ferric iron (Fe^{3+}) impurities present in the sample matrix into ferrous iron (Fe^{2+}).
- (c) Ferrous iron then reacts directly with the thioglycolic acid reagent in an ammoniacal solution to produce a stable coordination compound.
- (d) This reaction forms ferrous thioglycolate, a water-soluble coordination complex that displays a characteristic pale pink to deep reddish-purple color.
- (e) Citric acid is added to the mixture beforehand to prevent the premature precipitation of iron as insoluble ferric hydroxide by ammonia.
- (f) Ammonia provides the necessary alkaline medium required for the development and stability of the colored ferrous thioglycolate complex.

Final Answer: To reduce ferric iron (Fe^{3+}) to ferrous iron (Fe^{2+}) and form a stable pale pink to deep reddish-purple soluble coordination complex in an ammoniacal medium.

Answer: (B)

[Go Back to Question 11](#)



Q12.

Solution**Concept:**

Glaucoma treatment focuses heavily on lowering intraocular pressure to prevent irreversible optic nerve damage. For open-angle glaucoma, direct-acting muscarinic agonists are topically administered to stimulate the pupillary constrictor muscle and the ciliary muscle. This pharmacological contraction opens the trabecular meshwork, facilitating the drainage of aqueous humor through the canal of Schlemm.

Solution:

- (a) Direct-acting miotics physically bind to and activate muscarinic acetylcholine receptors present on the intraocular smooth muscle fibers.
- (b) Pilocarpine hydrochloride is a natural alkaloid that functions as a stable, direct-acting muscarinic agonist in ophthalmic therapies.
- (c) Its chemical architecture is completely resistant to rapid degradation by the localized acetylcholinesterase enzyme, ensuring a prolonged therapeutic duration.
- (d) Atropine sulfate and homatropine hydrobromide act as competitive muscarinic antagonists that cause mydriasis and cycloplegia, which can dangerously worsen glaucoma.
- (e) Physostigmine salicylate lowers intraocular pressure effectively but operates indirectly as a reversible acetylcholinesterase inhibitor rather than a direct receptor agonist.

Final Answer: Pilocarpine hydrochloride.

Answer: (B)

[Go Back to Question 12](#)



Q13.

Solution**Concept:**

Pharmaceutical dispersed systems are classified based on their particle size, thermodynamic parameters, and physical state. When volatile oils or lipophilic components are completely dispersed within an aqueous medium using optimized surfactant concentrations, they can form ultra-small droplets. If these droplets are small enough to avoid scattering light, the system remains transparent and stable.

Solution:

- (a) Aromatic waters are traditionally prepared as saturated aqueous solutions of volatile oils, but they can also be formulated via solubilization techniques.
- (b) Microemulsions are clear, isotropic, single-phase liquid systems where an oil phase is stabilized internally by a surfactant and co-surfactant monolayer.
- (c) These systems possess droplet diameters typically below 100 nanometers, preventing the visual turbidity associated with standard macroemulsions.
- (d) Unlike conventional coarse emulsions or flocculated suspensions, microemulsions represent thermodynamically stable configurations that do not undergo phase separation or creaming over time.
- (e) Flocculated systems and non-aqueous pastes consist of coarse, multi-phase structures that lack optical clarity and thermodynamic stability.

Final Answer: Microemulsion or solubilized aromatic water.

Answer: (B)

[Go Back to Question 13](#)



Q14.

Solution**Concept:**

Sterilization validation requires the use of biological indicators containing highly resistant bacterial endospores. These indicators serve as a biological challenge to confirm that a sterilization cycle possesses sufficient lethality to kill the most heat-resistant microbial life forms imaginable, ensuring a high sterility assurance level.

Solution:

- (a) Moist heat sterilization inside an autoclave kills microorganisms via the irreversible coagulation and denaturation of essential structural proteins and enzymes.
- (b) Bacterial endospores exhibit extreme resistance to thermal degradation due to their dehydrated core, protective cortex, and high dipicolinic acid content.
- (c) *Geobacillus stearothermophilus* is a non-pathogenic, thermophilic bacterium whose endospores demonstrate exceptional resistance to saturated steam under pressure.
- (d) This specific organism serves as the definitive compendial biological indicator for validating moist heat autoclave cycles at standard operating parameters.
- (e) *Bacillus subtilis* is typically utilized to validate dry heat sterilizers, while *Bacillus pumilus* serves as the standard challenge organism for gamma radiation sterilization validation.

Final Answer: *Geobacillus stearothermophilus*.

Answer: (B)

[Go Back to Question 14](#)



Q15.

Solution**Concept:**

Hemodynamic parameters like systemic blood pressure are directly regulated by autonomic receptor activation within the vascular beds. Alpha-1 adrenergic receptors are located predominantly on the smooth muscle cells of peripheral arterioles and venules. Activating these receptors triggers intracellular calcium release, leading to smooth muscle contraction and increased vascular resistance.

Solution:

- (a) Administering a competitive alpha-1 adrenergic antagonist prevents endogenous norepinephrine and epinephrine from binding to vascular smooth muscle receptors.
- (b) Blocking these receptors induces smooth muscle relaxation, leading to significant dilation of both the arteriolar resistance vessels and venular capacitance beds.
- (c) Dilation of the vascular smooth muscle decreases systemic vascular resistance, which lowers total peripheral resistance and blood pressure.
- (d) Selective peripheral vasodilation is a classic mechanism used by antihypertensive medications to ease the workload on the heart without causing localized vasoconstriction.
- (e) Profound vasoconstriction would increase blood pressure and trigger a reflex bradycardia, which is the exact opposite of an alpha-blocking agent's effect.

Final Answer: Arteriolar and venular vasodilation resulting in a reduction of total peripheral resistance.

Answer: (B)

[Go Back to Question 15](#)



Q16.

Solution**Concept:**

The Henderson-Hasselbalch equation is a fundamental mathematical model used to predict the pH behavior of buffer solutions. It describes the relationship between the pH of a system, the acid dissociation constant (pKa) of a weak conjugate pair, and the log ratio of the molar concentrations of the conjugate base and un-ionized acid.

Solution:

- (a) The mathematical expression for a weak acid buffer is defined as: $\text{pH} = \text{pKa} + \log\left(\frac{[\text{A}^-]}{[\text{HA}]}\right)$, where $[\text{A}^-]$ is the conjugate base and $[\text{HA}]$ is the un-ionized weak acid.
- (b) The problem states that the molar concentration of the conjugate base ($[\text{A}^-]$) is adjusted to be exactly ten times the concentration of the acid ($[\text{HA}]$).
- (c) Substituting this concentration relationship into the equation yields the following ratio:
$$\frac{[\text{A}^-]}{[\text{HA}]} = 10.$$
- (d) Evaluating the logarithmic component of the buffer equation results in: $\log(10) = 1$.
- (e) Substituting this back into the formula gives: $\text{pH} = \text{pKa} + 1$.
- (f) This calculation shows that increasing the base-to-acid ratio tenfold shifts the final pH exactly one unit above the pKa value.

Final Answer: $\text{pH} = \text{pKa} + 1$.

Answer: (B)

[Go Back to Question 16](#)



Q17.

Solution**Concept:**

The relative thermodynamic stability of geometric isomers in organic chemistry depends heavily on intramolecular non-bonded interactions. Alkenes possess a rigid carbon-carbon double bond that prevents free rotation, creating distinct cis and trans spatial configurations. The ground-state potential energy of these configurations varies based on how their functional groups are arranged in space.

Solution:

- (a) In a cis-alkene, the bulky alkyl groups are situated on the same side of the rigid carbon-carbon double bond.
- (b) This spatial proximity forces the electron clouds of the bulky groups to crowd one another, generating significant steric hindrance and van der Waals strain.
- (c) This steric crowding destabilizes the cis-configuration, raising its overall ground-state potential energy.
- (d) In the corresponding trans-isomer, the bulky alkyl groups are oriented on opposite sides of the carbon-carbon double bond.
- (e) This trans-orientation maximizes the spatial distance between the substituent groups, eliminating steric hindrance and lowering the molecule's ground-state potential energy.
- (f) Consequently, trans-alkenes are generally more thermodynamically stable than their corresponding cis-isomers.

Final Answer: Absence of steric hindrance between bulky alkyl groups in the trans-orientation.

Answer: (B)

[Go Back to Question 17](#)



Q18.

Solution**Concept:**

The walls of blood vessels are organized into three specialized structural layers: the tunica adventitia, tunica media, and tunica intima. Each layer performs specific physiological tasks necessary to sustain cardiovascular homeostasis, regulate blood flow dynamics, and maintain structural integrity under pressure.

Solution:

- (a) The innermost layer of a blood vessel, which directly faces the flowing blood in the lumen, is known as the tunica intima.
- (b) The tunica intima is lined by a single, continuous sheet of flattened squamous cells called the endothelium.
- (c) The endothelium acts as a semipermeable barrier that regulates the exchange of fluid and nutrients between the bloodstream and surrounding tissues.
- (d) Endothelial cells also synthesize nitric oxide, a powerful signaling molecule that diffuses into the adjacent tunica media to induce smooth muscle relaxation.
- (e) The tunica media contains smooth muscle cells responsible for vasoconstriction, while the tunica adventitia is an outer supportive layer composed primarily of collagen and fibroblasts.

Final Answer: Tunica intima endothelium.

Answer: (C)

[Go Back to Question 18](#)



Q19.

Solution**Concept:**

Chemical degradation in pharmaceutical liquids often follows specific catalytic pathways that are sensitive to the ionic composition of the solvent. Hydrolysis involves the breaking of covalent bonds by water molecules. This process can be accelerated if hydronium or hydroxyl ions participate directly in the reaction mechanism as catalysts.

Solution:

- (a) The chemical degradation of ester linkages in an aqueous vehicle often undergoes catalysis driven by changes in pH.
- (b) When the degradation rate increases due to alterations in hydronium ion (H_3O^+) concentration, the reaction exhibits specific acid catalysis.
- (c) If the reaction velocity increases due to changes in hydroxyl ion (OH^-) concentration, it is classified as specific base catalysis.
- (d) These catalytic ions alter the reaction mechanism by protonating or deprotonating functional groups, lowering the activation energy barrier for ester cleavage.
- (e) Photolytic degradation is driven by light absorption, while thermal pyrolysis involves heat-induced decomposition in the absence of water.

Final Answer: Specific acid or base catalysis.

Answer: (B)

[Go Back to Question 19](#)



Q20.

Solution**Concept:**

Phytochemical identification tests utilize distinct colorimetric reactions to confirm the presence of specific diagnostic secondary metabolites in crude vegetable drugs. Senna leaflets, derived from *Cassia angustifolia*, contain anthraquinone glycosides that serve as potent stimulant laxatives. The specific chemical linkages in these glycosides can be identified using targeted color reactions.

Solution:

- (a) Standard Born-trager's test identifies free anthraquinone aglycones but fails to detect anthraquinones present as glycosides without prior hydrolysis.
- (b) The modified Born-trager's test uses ferric chloride and hydrochloric acid to hydrolyze and oxidize complex anthraquinone glycosides, such as C-glycosides or reduced O-glycosides.
- (c) Ferric chloride acts as an oxidizing agent, while hydrochloric acid hydrolyzes the glycosidic bonds to liberate the free anthraquinone structures.
- (d) Shaking the organic benzene extract with dilute ammonia transfers the oxidized anthraquinones into the alkaline aqueous layer.
- (e) The development of a distinct rose-pink color in the ammoniacal phase confirms the presence of these anthraquinone constituents in the senna sample.

Final Answer: O-anthraquinone glycosides (Modified Born-trager's positive constituents).

Answer: (C)

[Go Back to Question 20](#)



Q21.

Solution**Concept:**

The Hydrophilic-Lipophilic Balance (HLB) value represents an empirical scale expressing the relative hydrophilicity or lipophilicity of surface-active agents. When manufacturing a stable pharmaceutical emulsion, surfactant blends are frequently employed to hit a precise required target HLB value. The composition of the blend can be calculated using a weighted average algebraic formula based on the individual mass fractions and individual HLB values of the constituent surfactants.

Solution:

- (a) Let the total mass of the surfactant mixture be represented by W , where $W = 10.0$ g.
- (b) Let the mass fraction of Tween 80 be x , which means the mass fraction of Span 80 within the mixture is represented by $(1 - x)$.
- (c) The required algebraic relationship for the target blend HLB value is given by the formula:
$$\text{HLB}_{\text{blend}} = (x \times \text{HLB}_{\text{Tween}}) + ((1 - x) \times \text{HLB}_{\text{Span}}).$$
- (d) Substituting the known experimental values into the equation yields: $12.0 = (x \times 15.0) + ((1 - x) \times 4.3)$.
- (e) Expanding and simplifying the expression gives: $12.0 = 15.0x + 4.3 - 4.3x$, which simplifies further to $7.7 = 10.7x$.
- (f) Solving for the mass fraction results in $x = \frac{7.7}{10.7} \approx 0.7196$.
- (g) To find the absolute weight of Tween 80 required, multiply the mass fraction by the total mass: $\text{Weight} = 0.7196 \times 10.0 \text{ g} = 7.196 \text{ g}$, which rounds to 7.20 g.

Final Answer: 7.20 g**Answer: (B)**[Go Back to Question 21](#)

Q22.

Solution**Concept:**

The Pharmacy Act of 1948 provides a detailed administrative framework for regulating the profession and practice of pharmacy across India. Under this act, the Central Government establishes the Pharmacy Council of India (PCI) as a supreme corporate body. The constitution of the Central Council consists of three distinct categories of members: elected members, nominated members, and ex-officio members who hold their seats automatically by virtue of their official administrative roles.

Solution:

- (a) Ex-officio membership is permanently attached to a specific institutional position, meaning the individual serves on the council automatically without needing election or nomination.
- (b) According to the statutory provisions of the Pharmacy Act, there are three primary ex-officio positions specified for the Central Council.
- (c) These positions are the Director General of Health Services, the Director of the Central Drugs Laboratory, and the Drugs Controller General of India.
- (d) The Director General of Health Services brings essential public health administration insights to the council to help shape national educational guidelines.
- (e) Elected members include six individuals chosen by the University Grants Commission from pharmacy teaching staff and one representative chosen by the Medical Council of India.
- (f) Nominated and state-level elected members are selected through separate administrative pathways to represent regional interests, rather than holding automatic ex-officio status.

Final Answer: The Director General of Health Services

Answer: (B)

[Go Back to Question 22](#)



Q23.

Solution**Concept:**

Michaelis-Menten kinetics serves as the standard mathematical model describing the relationship between the initial reaction velocity of an enzyme-catalyzed reaction and the concentration of its substrate. The Michaelis constant (K_m) is defined as the specific substrate concentration at which the initial reaction velocity reaches exactly half of its maximum achievable value (V_{\max}), reflecting the operational affinity between the enzyme active site and the substrate.

Solution:

- (a) The classic Michaelis-Menten algebraic equation is formulated as: $v_0 = \frac{V_{\max}[S]}{K_m + [S]}$, where v_0 is the initial velocity and $[S]$ represents the substrate concentration.
- (b) The problem specifies that the operating substrate concentration is adjusted to be exactly twice the value of the Michaelis constant, which means $[S] = 2K_m$.
- (c) Substituting this operational value into the standard Michaelis-Menten equation gives the following relationship: $v_0 = \frac{V_{\max}(2K_m)}{K_m + 2K_m}$.
- (d) Simplifying the denominator term by combining the constants results in a value of $3K_m$, giving the expression: $v_0 = \frac{2V_{\max}K_m}{3K_m}$.
- (e) Canceling out the common K_m factor from both the numerator and the denominator simplifies the fraction directly to $\frac{2}{3}$.
- (f) This mathematical simplification shows that the initial reaction velocity matches two-thirds of the maximum velocity: $v_0 = \frac{2}{3}V_{\max}$.

Final Answer: $v_0 = \frac{2}{3}V_{\max}$

Answer: (B)

[Go Back to Question 23](#)



Q24.

Solution**Concept:**

Anti-anginal ischemic therapy aims to restore the balance between myocardial oxygen supply and demand during acute coronary episodes. Organic nitrates are highly effective prodrugs deployed in emergency clinical settings due to their rapid onset of action when given via the sublingual route. These agents target the smooth muscle cells lining peripheral blood vessels to bring about systemic therapeutic modifications.

Solution:

- (a) Sublingual nitroglycerin undergoes rapid systemic absorption through the oral mucosa, completely bypassing the destructive first-pass hepatic metabolism.
- (b) Once inside the vascular smooth muscle cells, nitroglycerin is converted biochemically to release free nitric oxide (NO).
- (c) The liberated nitric oxide binds to and stimulates the intracellular enzyme soluble guanylyl cyclase (sGC).
- (d) Activating this enzyme catalyzes the conversion of guanosine triphosphate (GTP) into cyclic guanosine monophosphate (cGMP).
- (e) Rising levels of intracellular cGMP trigger protein kinase activation, leading to dephosphorylation of myosin light chains and reduced calcium entry.
- (f) This cellular cascade produces profound relaxation of vascular smooth muscle, causing venodilation that reduces cardiac preload and eases myocardial oxygen demand.

Final Answer: Stimulation of soluble guanylyl cyclase, leading to increased intracellular cyclic GMP and vascular smooth muscle relaxation

Answer: (B)

[Go Back to Question 24](#)



Q25.

Solution**Concept:**

Pharmaceutical quality management relies on strict regulatory frameworks to guarantee the safety, identity, strength, and purity of manufactured medicinal products. Cross-contamination within multi-product manufacturing plants poses a severe risk to patient safety. National regulatory acts include comprehensive schedules that dictate the minimum infrastructure, facility design, and operational standards required to eliminate these technical risks.

Solution:

- (a) Under the Drugs and Cosmetics Act of 1940 and Rules of 1945 in India, Schedule M outlines the statutory mandates for Good Manufacturing Practices (GMP).
- (b) Schedule M provides highly detailed specifications regarding the architectural layout, air handling systems, and physical separation of processing zones.
- (c) These strict design guidelines are specifically engineered to prevent physical mix-ups and airborne cross-contamination between different therapeutic classes.
- (d) Good Laboratory Practices (GLP) focus primarily on ensuring the quality and integrity of non-clinical safety data generated within analytical testing laboratories.
- (e) Schedule V deals exclusively with standard qualitative parameters and guidelines for patent or proprietary medicines.
- (f) International ISO 9001 standards outline general quality management principles but lack the specific pharmaceutical legal authority provided by Schedule M.

Final Answer: Current Good Manufacturing Practices (cGMP) as per Schedule M

Answer: (B)

[Go Back to Question 25](#)



Q26.

Solution**Concept:**

Molarity is a fundamental chemical expression representing the number of moles of a solute dissolved per liter of a final solution. Quantitative laboratory calculations require converting target molar volumes into absolute mass values using the molecular weight of the solute, allowing chemists to accurately prepare standard reagent solutions.

Solution:

- (a) The standard formula relating molarity, mass, molecular weight, and volume is defined as:

$$\text{Molarity } (M) = \frac{\text{Mass of solute (g)}}{\text{Molecular Weight}} \times \frac{1000}{\text{Volume of solution (mL)}}.$$

- (b) The problem provides the following experimental parameters: target Molarity = 0.1 M, target Volume = 500 mL, and Molecular Weight of $NaOH = 40$.

- (c) Rearranging this fundamental algebraic equation to solve directly for the mass of the solute yields: $\text{Mass (g)} = \frac{\text{Molarity} \times \text{Molecular Weight} \times \text{Volume (mL)}}{1000}$.

- (d) Substituting the values into the rearranged equation gives: $\text{Mass (g)} = \frac{0.1 \times 40 \times 500}{1000}$.

- (e) Multiplying the terms in the numerator simplifies the expression to: $\text{Mass (g)} = \frac{2000}{1000}$.

- (f) Dividing the terms yields a final required mass of exactly 2.00 g of pure sodium hydroxide pellets.

Final Answer: 2.00 g

Answer: (B)

[Go Back to Question 26](#)



Q27.

Solution**Concept:**

Clinical drug safety monitoring involves identifying predictable, dose-dependent organ toxicities tied to narrow therapeutic index drugs. Aminoglycosides are highly potent, concentration-dependent bactericidal antibiotics utilized for severe gram-negative infections, but their structural properties cause them to accumulate selectively within certain specialized epithelial tissues.

Solution:

- (a) Aminoglycoside molecules undergo renal elimination via glomerular filtration, but a fraction is actively reabsorbed by proximal tubule epithelial cells.
- (b) This tissue accumulation damages the renal tubules, manifesting as a steady decrease in glomerular filtration rate and a corresponding rise in serum creatinine.
- (c) Regular lab monitoring of serum creatinine levels serves as a critical clinical marker to catch this drug-induced nephrotoxicity early.
- (d) These antibiotics also accumulate within the endolymph and perilymph of the inner ear, permanently damaging sensitive cochlear and vestibular hair cells.
- (e) This hair cell destruction results in progressive, irreversible ototoxicity that must be tracked clinically using regular audiometric sensory profiling.
- (f) Aminoglycosides do not cause high rates of hepatic cirrhosis, bone marrow failure, or pulmonary fibrosis, making auditory and renal tracking the highest monitoring priorities.

Final Answer: Nephrotoxicity and irreversible ototoxicity

Answer: (B)

[Go Back to Question 27](#)



Q28.

Solution**Concept:**

Pharmacognostic classification groups crude drugs derived from natural origins based on their physical structural state. Organized crude drugs consist of defined cellular tissues obtained directly from plant organs, such as leaves, barks, roots, or fruits. Unorganized crude drugs are complex mixtures lacking cellular structure, prepared directly from plants through physical processing methods like incision, extraction, expression, or exudation.

Solution:

- (a) Cinchona segments, digitalis leaves, and fennel fruits maintain their complex cellular histology, classifying them as organized crude drugs under a microscope.
- (b) Opium is an unorganized crude drug obtained by making precise incisions in the unripe capsules of the poppy plant, *Papaver somniferum*.
- (c) This mechanical incision causes a milky internal juice to exude from the plant tissue, which air-dries into a gummy latex mass.
- (d) Because this dried latex mass consists of solidified chemical secretions rather than intact cells, it is classified as an unorganized crude drug.
- (e) This latex exudate contains a rich mixture of isoquinoline alkaloids, including morphine and codeine, which are held within a non-cellular matrix.

Final Answer: Opium poppy exudate

Answer: (C)

[Go Back to Question 28](#)



Q29.

Solution**Concept:**

The cardiac action potential in ventricular myocytes consists of five distinct, sequential phases that reflect changes in membrane permeability to specific ions. These highly regulated ionic translocations across the sarcolemma generate a characteristic voltage curve over time, which coordinates synchronous mechanical contraction and relaxation cycles within the heart.

Solution:

- (a) Phase 0 represents rapid depolarization driven by the sudden opening of voltage-gated sodium channels, causing a massive influx of sodium ions.
- (b) Phase 1 is a brief early repolarization notch caused by the rapid inactivation of sodium channels alongside a transient efflux of potassium ions.
- (c) Phase X represents Phase 2, a prolonged plateau stage unique to cardiac muscle action potentials that delays tissue repolarization.
- (d) This plateau is sustained by a precise thermodynamic balance between the slow inward influx of calcium ions through L-type channels and the outward efflux of potassium ions.
- (e) This calcium influx is essential for triggering calcium-induced calcium release from the sarcoplasmic reticulum, initiating mechanical muscle contraction.
- (f) Phase 3 marks rapid terminal repolarization where calcium channels close completely while potassium efflux accelerates to restore the negative resting potential.

Final Answer: Phase X (Phase 2 plateau stage)

Answer: (C)

[Go Back to Question 29](#)



Q30.

Solution**Concept:**

Toxicological emergencies involving narcotic analgesic overdoses require rapid administration of targeted pharmacological antidotes. Opioid toxicity presents with a classic clinical triad: profound central nervous system and respiratory depression, miosis (pinpoint pupils), and severe bradycardia. Reversing these life-threatening symptoms requires an antagonist capable of displacing the narcotic molecules from their target receptors.

Solution:

- (a) Potent narcotic analgesics exert their physiological actions by binding as strong agonists to central and peripheral mu-opioid receptors.
- (b) Naloxone hydrochloride is a pure, highly selective opioid receptor antagonist with an exceptionally strong competitive binding affinity.
- (c) When injected, it rapidly displaces narcotic molecules from mu receptors, completely reversing opioid-induced respiratory depression within minutes.
- (d) Flumazenil serves as a highly specific competitive antagonist at the benzodiazepine binding site, used to reverse sedative-hypnotic overdoses.
- (e) Atropine sulfate is an anticholinergic drug given to counter muscarinic toxicity, while pralidoxime chloride reactivates acetylcholinesterase during organophosphate poisoning.

Final Answer: Naloxone hydrochloride

Answer: (B)

[Go Back to Question 30](#)



Q31.

Solution**Concept:**

Powder flow properties are fundamental material characteristics that heavily influence pharmaceutical solid dosage form manufacturing processes like capsule filling and tablet compression. Interparticulate friction and cohesive forces alter how a bulk powder moves through industrial hoppers and die cavities. Carr's Compressibility Index quantifies these relationships by comparing the structural packaging change between a loose bulk state and a mechanically settled tapped state.

Solution:

- (a) Carr's Compressibility Index is determined mathematically using the standard percentage ratio formula:
$$\text{Index} = \frac{\text{Tapped Density} - \text{Bulk Density}}{\text{Tapped Density}} \times 100.$$
- (b) A low value reflects minimal packing changes under mechanical agitation, pointing to weak interparticulate cohesive forces and highly favorable free-flowing characteristics.
- (c) Standard pharmacopoeial scales classify values between 5% and 15% as excellent or good, signifying materials highly suitable for direct high-speed machinery processing.
- (d) As the index value climbs, it reveals significant void space reductions, which demonstrates strong mechanical cohesion and severe interparticulate friction within the material bed.
- (e) An index value matching 35% falls deep within the very poor to fluid/cohesive boundary range, meaning direct handling is impossible without heavy granulated alterations.
- (f) This mechanical assessment confirms that the formulation exhibits a highly cohesive and poorly flowing matrix that requires immediate wet or dry granulation steps.

Final Answer: Very poor and highly cohesive

Answer: (C)

[Go Back to Question 31](#)



Q32.

Solution**Concept:**

Endocrine homeostasis relies on the precise synthesis, axonal transport, and regulated systemic secretion of specialized peptide hormones. The posterior pituitary gland, or neurohypophysis, serves as a functional storage and release site for hormones synthesized within the supraoptic and paraventricular nuclei of the hypothalamus. Absolute absolute deficiencies in these pathways lead to severe systemic water imbalances.

Solution:

- (a) Vasopressin, also widely termed antidiuretic hormone, is an octapeptide cyclic hormone synthesized inside specialized hypothalamic neuronal cell bodies.
- (b) Once synthesized, it travels down the infundibular axonal pathway attached to neurophysin carrier proteins to be stored inside posterior pituitary nerve terminals.
- (c) The principal physiological trigger for its release into systemic circulation is an increase in plasma osmolality or a drop in blood volume.
- (d) Inside the renal collecting ducts, vasopressin binds to basolateral V2 receptors, triggering the apical insertion of aquaporin-2 water channels to drive water reabsorption.
- (e) An absolute lack of this nonapeptide structure prevents renal water reclamation, causing massive volumes of dilute urine to pass through the collecting system.
- (f) This chronic fluid loss produces the classic endocrine profile of central diabetes insipidus, characterized by severe polyuria and compensatory polydipsia.

Final Answer: Vasopressin (Antidiuretic Hormone)

Answer: (B)

[Go Back to Question 32](#)



Q33.

Solution**Concept:**

The Drugs and Cosmetics Act and Rules provide a legal framework for the safe distribution, retailing, and labeling of therapeutic compounds across India. To prevent dangerous self-medication practices and manage potent therapeutics safely, medicinal substances are divided into statutory schedules. Each schedule carries distinct administrative mandates regarding retail container warnings and medical oversight.

Solution:

- (a) Prescription-only drugs that require the explicit guidance and written authorization of a licensed practitioner are organized primarily under Schedule H.
- (b) The statutory rules mandate that all containers of Schedule H substances must display a prominent, clear warning label detailing its prescription status.
- (c) This label text reads: "Warning: To be sold by retail on the prescription of a Registered Medical Practitioner only," alerting retail dispensers.
- (d) Schedule X includes highly restricted habit-forming narcotic and psychotropic substances that require duplicate prescription records and specialized storage.
- (e) Schedule G governs substances that require medical supervision during use but do not carry the exact retail prescription restriction wording of Schedule H.
- (f) Schedule P dictates the precise shelf-life periods, degradation timelines, and specific storage temperature conditions for sensitive biological and antimicrobial agents.

Final Answer: Schedule H

Answer: (B)

[Go Back to Question 33](#)



Q34.

Solution**Concept:**

Pharmaceutical stability and chemical integrity depend heavily on maintaining proper environmental storage temperatures. Compendial monographs specify standardized storage terms to eliminate ambiguity during inventory management. Maintaining these strict thermal limits prevents accelerated chemical degradation, physical phase separation, or loss of biological potency in stored products.

Solution:

- (a) Pharmacopoeias define specific terms like cold, cool, room temperature, and warm to establish precise numerical limits for medical storage zones.
- (b) A "Cold Place" is explicitly defined as any environment maintaining a controlled thermal range between 2°C and 8°C.
- (c) This specific temperature range is typically maintained inside standard laboratory walk-in refrigerators to protect sensitive biologicals and vaccines.
- (d) A "Cool Place" represents a slightly warmer environment, defined as any space maintaining temperatures between 8°C and 25°C.
- (e) Storage environments dropping strictly below 0°C or staying between -10°C and -20°C are classified as deep-freeze storage zones.
- (f) Adhering to the 2°C to 8°C limit prevents water-based formulations from freezing while minimizing the kinetic rate of chemical degradation pathways.

Final Answer: Between 2°C and 8°C

Answer: (A)

[Go Back to Question 34](#)



Q35.

Solution**Concept:**

Clinical pharmacy practices focus on optimizing drug therapy safety and efficacy through patient-specific monitoring protocols. Narrow therapeutic index medications require regular biochemical testing because minor changes in blood concentration can lead to therapeutic failure or severe systemic toxicity. Managing these complex drug regimens requires continuous clinical oversight.

Solution:

- (a) Oral anticoagulants like warfarin work by antagonizing vitamin K epoxide reductase, which reduces the synthesis of functional clotting factors II, VII, IX, and X.
- (b) Because individual patient responses vary based on genetics, diet, and concurrent medications, a fixed dosing approach is unsafe.
- (c) The Prothrombin Time test, converted into an International Normalized Ratio (INR), provides a standardized measurement of extrinsic coagulation pathway activity.
- (d) An elevated INR reveals a high risk of hemorrhage, while a depressed value indicates inadequate anticoagulation and a risk of thromboembolism.
- (e) Tracking this parameter allows clinical pharmacists to make precise dose adjustments, directly monitoring patient safety and therapeutic efficacy.
- (f) This active patient assessment exemplifies direct clinical pharmacy monitoring, rather than broad public screening or simple inventory control.

Final Answer: Clinical pharmacy monitoring for therapeutic efficacy and safety

Answer: (B)

[Go Back to Question 35](#)



Q36.

Solution**Concept:**

Instrumental analysis utilizes the interaction of electromagnetic radiation with chemical bonds to confirm molecular structure. Different regions of the electromagnetic spectrum excite different energetic states within a molecule. Measuring the specific wavelengths absorbed allows analysts to identify key structural features and map functional groups.

Solution:

- (a) Infrared spectroscopy utilizes low-energy radiation spanning the mid-infrared region to analyze the structural characteristics of organic compounds.
- (b) When an organic molecule absorbs infrared light, the radiation matches the energy gaps between distinct vibrational states within its covalent bonds.
- (c) This absorption triggers specific molecular vibrations, such as stretching and bending motions, without altering electronic or nuclear spin states.
- (d) Every distinct covalent link absorbs a characteristic frequency, creating a unique spectral fingerprint for functional groups like alkyl chains or carbonyls.
- (e) Ultraviolet-Visible spectroscopy relies on higher-energy radiation to trigger electronic transitions across conjugated pi systems.
- (f) Nuclear Magnetic Resonance spectroscopy uses radiofrequency radiation to alter nuclear spin alignments within strong external magnetic fields.

Final Answer: Infrared (IR) Spectroscopy

Answer: (B)

[Go Back to Question 36](#)



Q37.

Solution**Concept:**

Size reduction is a critical pharmaceutical unit operation used to increase surface area, enhance dissolution rates, and ensure blend uniformity. Industrial mills utilize mechanical forces like impact, attrition, compression, or shearing to break down materials. The choice of milling equipment depends on the physical properties and abrasiveness of the raw drug powder.

Solution:

- (a) A ball mill consists of a horizontally rotating hollow cylindrical vessel containing heavy spherical grinding media made of steel or porcelain.
- (b) As the cylinder rotates, the internal grinding balls are lifted by the vessel walls until they reach a critical angle and cascade downward.
- (c) This movement subjects the material to a combination of high-energy impact forces from falling balls and intense interparticulate attrition.
- (d) This dual action makes ball mills highly effective for grinding hard, abrasive materials into fine powders without causing excessive tool wear.
- (e) Hammer mills rely primarily on high-speed swinging blades to break friable solids apart via direct impact forces.
- (f) Fluid energy mills use high-velocity compressed air streams to break particles down through high-impact collisions within a fluid vortex.

Final Answer: Ball Mill**Answer: (B)**[Go Back to Question 37](#)

Q38.

Solution**Concept:**

Bioavailability is a primary pharmacokinetic parameter that describes the rate and extent to which an active drug moiety enters systemic circulation. The total systemic drug exposure over time is represented graphically by the Area Under the Plasma Concentration-Time Curve (AUC), which serves as a metric for comparing the efficiency of different drug formulations.

Solution:

- (a) The total Area Under the Curve value is directly proportional to the absolute amount of active drug that successfully accesses the bloodstream.
- (b) When evaluating identical oral doses, any difference in AUC reflects variations in how efficiently the formulation releases the drug for systemic absorption.
- (c) The finding that Formulation A displays an AUC twice as large as Formulation B demonstrates that Formulation A delivers a much higher proportion of its dose.
- (d) This observation confirms that Formulation A exhibits a significantly greater extent of systemic bioavailability than the competing formulation.
- (e) A smaller AUC typically indicates incomplete absorption or extensive first-pass hepatic extraction within the gastrointestinal pathway.
- (f) The AUC ratio directly measures systemic delivery efficiency, rather than defining independent metrics like renal clearance rates or the apparent volume of distribution.

Final Answer: Formulation A has a significantly higher extent of systemic bioavailability than Formulation B.

Answer: (B)

[Go Back to Question 38](#)



Q39.

Solution**Concept:**

Compendial limit tests are semi-quantitative analytical procedures designed to identify and restrict trace chemical impurities within pharmaceutical substances. Heavy metal limit tests rely on a visible precipitation reaction between metallic contaminants and sulfide reagents under tightly controlled pH parameters, allowing analysts to visually evaluate purity against a standard standard.

Solution:

- (a) The standard limit test for heavy metals operates on the principle that trace metallic impurities react readily with sulfur ions in an aqueous matrix.
- (b) When exposing the test sample to hydrogen sulfide or sodium sulfide reagents, elements like lead, mercury, and copper react to form metallic sulfides.
- (c) These resulting metallic sulfide compounds are highly insoluble, producing a distinct colloidal dispersion within the testing tube.
- (d) This insoluble dispersion scatters light, manifesting visually as a characteristic faint brownish-black coloration throughout the solution.
- (e) The intensity of this dark coloration is directly proportional to the absolute concentration of heavy metal contaminants present in the sample.
- (f) Analysts compare the color intensity against a parallel standard solution containing a known concentration of lead to determine pass or fail status.

Final Answer: Insoluble colloidal dispersions of metallic sulfides appearing as a brownish-black coloration

Answer: (B)

[Go Back to Question 39](#)



Q40.

Solution**Concept:**

Microscopic botanical evaluation serves as a highly reliable method for confirming the identity and purity of crude drugs. Structural features, such as specialized trichomes, calcium oxalate crystals, stomatal arrangements, or secretory cavities, provide definitive diagnostic markers that distinguish authentic plant tissues from adulterants.

Solution:

- (a) Clove consists of the dried, unexpanded flower buds harvested from the volatile oil-rich tree species *Eugenia caryophyllus*.
- (b) Transverse sections of the clove hypanthium reveal a highly characteristic arrangement of large, bright schizolysigenous secretory cavities.
- (c) These specialized secretory cavities synthesize and store large amounts of a dense volatile oil composed primarily of the aromatic phenol eugenol.
- (d) The presence of these prominent internal oil structures under a microscope serves as a primary diagnostic index for verifying authentic clove buds.
- (e) Coriander fruits feature distinct secretory channels termed vitae, while cinnamon barks contain isolated oil cells rather than large schizolysigenous cavities.
- (f) Senna leaflets contain calcium oxalate prisms and specialized unicellular trichomes, lacking the large volatile oil cavities characteristic of clove tissue.

Final Answer: Clove buds

Answer: (C)

[Go Back to Question 40](#)



Q41.

Solution**Concept:**

Stereochemistry focuses heavily on the three-dimensional spatial arrangements of atoms within organic molecular networks. A fundamental structural marker for molecular asymmetry is the presence of a tetrahedral carbon center bound to asymmetric environments. This specific spatial orientation lacks internal mirror planes or inversion points, rendering the geometric infrastructure non-superimposable on its own mirror image.

Solution:

- (a) When an sp^3 -hybridized carbon atom links covalently to four completely distinct structural groups or atoms, it forms an asymmetric geometric center.
- (b) This unique configuration is formally designated as a chiral center or stereocenter in chemical nomenclature.
- (c) The absolute non-superimposability of its mirror image configuration defines the property of molecular chirality, creating a pair of enantiomers.
- (d) A meso center contains multiple chiral centers but features an internal plane of symmetry that renders the overall molecule optically inactive.
- (e) Geometrical isomer nodes involve restricted bond rotations, such as carbon-carbon double bonds, which give rise to distinct cis or trans structural orientations.
- (f) An allylic position denotes a saturated carbon atom located directly adjacent to a carbon-carbon double bond, rather than describing center asymmetry.

Final Answer: Chiral center

Answer: (B)

[Go Back to Question 41](#)



Q42.

Solution**Concept:**

Public health epidemiology addresses broad population-level containment frameworks to halt the transmission cascades of endemic water-borne pathogens. Infectious bacterial pathogens like *Vibrio cholerae* colonize community drinking water systems, multiplying rapidly in the absence of chemical barriers. Devising scalable, cost-effective environmental interventions is vital for primary prevention in developing regions.

Solution:

- (a) *Vibrio cholerae* is transmitted primarily via the fecal-oral route through the ingestion of public drinking water contaminated with human sewage.
- (b) Controlled chlorination of communal drinking water wells and storage tanks acts as an exceptionally cost-effective chemical disinfection method.
- (c) The added chlorine forms hypochlorous acid, which rapidly penetrates bacterial cell walls to oxidize essential metabolic enzymes and neutralize pathogens.
- (d) This simple community intervention provides widespread primary prevention by breaking the transmission cycle before the pathogen can infect human hosts.
- (e) Broad-spectrum antibiotics represent a secondary therapeutic treatment for established clinical cases rather than a primary preventative public health strategy.

Final Answer: Disinfection of community drinking water sources via controlled chlorination

Answer: (B)

[Go Back to Question 42](#)



Q43.

Solution**Concept:**

Hospital pharmacy operations include detailed material management protocols alongside standard clinical services to sustain essential drug inventories. Effective material management relies on legal purchasing processes to regulate institutional capital spend. Procurement personnel must structure formal purchase agreements with clear clauses to prevent supply chain disruptions or legal disputes.

Solution:

- (a) Purchasing and procurement management involves the systematic sourcing, contract negotiation, ordering, and validation of chemical and pharmaceutical inventory.
- (b) When a pharmacy manager creates a formal purchase order for life-saving drugs, they must include specific commercial shipping parameters.
- (c) Defining the exact delivery timelines, transport liability insurance, and transfer points for title ownership establishes binding contractual duties for the vendor.
- (d) These standardized administrative protocols protect the hospital from financial losses during shipping and guarantee supply continuity.
- (e) This process belongs under corporate material purchasing workflows, rather than clinical diagnostics, patient compliance counseling, or Pharmacy Council organization.

Final Answer: Purchasing and procurement management

Answer: (B)

[Go Back to Question 43](#)



Q44.

Solution**Concept:**

Cardiovascular pharmacology relies on receptor-selective antagonists to modulate autonomic signals in patients managing primary hypertension. Adrenergic pathways feature distinct receptor subtypes distributed across specialized organ systems. Cardioselective blockers target specific receptors concentrated in cardiac tissue, minimizing unintended smooth muscle responses in the bronchial and peripheral vascular beds.

Solution:

- (a) Beta-1 adrenergic receptors are located primarily on cardiac myocytes, where they mediate increases in heart rate, conduction velocity, and myocardial contractility.
- (b) Atenolol is a second-generation, hydrophilic antagonist that binds selectively to peripheral vascular and cardiac beta-1 receptors over beta-2 receptors.
- (c) It acts as a pure competitive antagonist, meaning it lacks intrinsic sympathomimetic activity or partial agonist properties that could inadvertently stimulate the heart.
- (d) It also lacks membrane-stabilizing local anesthetic activity, making it an excellent choice for lowering blood pressure by reducing cardiac output.
- (e) Propranolol hydrochloride is a highly lipophilic, non-selective beta-blocker that antagonizes both beta-1 and beta-2 receptors equally, increasing bronchoconstriction risks.
- (f) Phentolamine mesylate acts as an alpha-adrenergic receptor antagonist, whereas isoproterenol hydrochloride operates as a potent, non-selective beta receptor agonist.

Final Answer: Atenolol**Answer:** (B)[Go Back to Question 44](#)

Q45.

Solution**Concept:**

Clinical biochemistry assesses the functional synthetic capacity of visceral organs by quantifying specific macromolecular biomarkers in blood plasma. Albumin is a major plasma protein synthesized exclusively by hepatic parenchymal cells. It maintains intravascular oncotic pressure and serves as a primary carrier molecule for hydrophobic hormones and drugs throughout the bloodstream.

Solution:

- (a) Hepatic parenchymal tissues possess massive functional capacity to synthesize essential blood elements, including albumin, fibrinogen, and globulins.
- (b) Advanced chronic hepatic cirrhosis causes widespread fibrotic remodeling of liver tissue, severely impairing the organ's protein synthesis pathways.
- (c) Severe protein malnutrition also restricts the amino acid pools required for translation, resulting in a marked drop in circulating serum albumin.
- (d) The resulting state of hypoalbuminemia lowers intravascular oncotic pressure, which can lead to fluid shifts and clinical edema.
- (e) Acute upper respiratory infections, localized skeletal muscle injuries, and parathyroid hypersecretion do not cause severe reductions in global hepatic protein synthesis.

Final Answer: Advanced chronic hepatic cirrhosis or severe protein malnutrition

Answer: (A)

[Go Back to Question 45](#)



Q46.

Solution**Concept:**

Hematological pharmacology exploits enzyme-inhibiting pathways within the eicosanoid cascade to regulate intravascular coagulation events. Blood platelets lack nuclei and cannot synthesize new proteins, making them highly vulnerable to irreversible enzymatic inactivation. Blocking these intraplatelet pathways prevents the downstream synthesis of pro-aggregatory arachidonic acid metabolites.

Solution:

- (a) Cyclooxygenase-1 (COX-1) catalyzes the initial conversion of arachidonic acid into unstable prostaglandin endoperoxides inside blood platelets.
- (b) Under normal conditions, these endoperoxides are converted by thromboxane synthase into Thromboxane A₂ (TXA₂), a potent vasoconstrictor and platelet activator.
- (c) Irreversible inhibition of platelet COX-1 permanently blocks the synthesis of Thromboxane A₂ for the remaining lifespan of those platelets.
- (d) Suppressing TXA₂ synthesis reduces platelet aggregation, which helps prevent arterial thrombus formation in high-risk cardiovascular patients.
- (e) Leukotriene B₄ is synthesized via the 5-lipoxygenase pathway rather than the cyclooxygenase pathway, so it is unaffected by COX inhibitors.
- (f) Interleukin-2 functions as a peptide cytokine secreted by T-cells, while histamine is stored in basophils and mast cells, neither of which rely on platelet COX – 1.

Final Answer: Thromboxane A₂, leading to an inhibition of platelet aggregation

Answer: (A)

[Go Back to Question 46](#)



Q47.

Solution**Concept:**

Neuroanatomy categorizes the human nervous system into functional divisions based on the anatomical pathways and tissues they innervate. Involuntary homeostatic visceral functions are coordinated by a specialized division that operates largely outside conscious control. This system features a two-neuron efferent pathway consisting of pre-ganglionic and post-ganglionic fibers that synapse within peripheral ganglia.

Solution:

- (a) The autonomic nervous system (ANS) manages homeostatic visceral activities, including heart rate adjustments, pupillary constriction, and gastrointestinal motility.
- (b) Its efferent signaling framework utilizes a pre-ganglionic neuron originating in the central nervous system that projects out to an autonomic ganglion.
- (c) Inside this peripheral ganglion, the axon releases neurotransmitters to excite a post-ganglionic neuron, which travels onward to innervate the target visceral organ.
- (d) This two-neuron relay system is a defining anatomical feature of both the sympathetic and parasympathetic branches of the autonomic nervous system.
- (e) The somatic motor system utilizes a single, uninterrupted lower motor neuron that projects from the central nervous system directly to voluntary skeletal muscles.

Final Answer: Autonomic Nervous System

Answer: (B)

[Go Back to Question 47](#)



Q48.

Solution**Concept:**

Pharmaceutical distribution within India is strictly governed by statutory licensing regulations detailed under the Drugs and Cosmetics Rules. Biological products, special toxins, and potent habit-forming psychotropic substances require rigid distribution monitoring to prevent public health hazards. Wholesale operations dealing with restricted schedules must apply using specific legal forms.

Solution:

- (a) Schedules C and C1 encompass sensitive biological and special products like serums, vaccines, and vitamins, while Schedule X regulates potent, habit-forming psychotropic drugs.
- (b) The Drugs and Cosmetics Rules mandate that applications for licenses to stock, exhibit, or distribute these substances must be filed using specific forms.
- (c) Form 19 is the standard application form used to request a wholesale license for general drugs, including those listed in Schedules C and C1.
- (d) Form 19C is the dedicated application form required to secure a license to sell, stock, or distribute the restricted psychotropic substances listed in Schedule X.
- (e) Consequently, an applicant preparing to distribute items across all three schedules must submit both Form 19 and Form 19C to the relevant licensing authority.

Final Answer: Form 19 and Form 19C

Answer: (A)

[Go Back to Question 48](#)



Q49.

Solution**Concept:**

Pharmaceutical pre-formulation science addresses the physical chemistry parameters needed to design stable liquid suspensions. Coarse liquid suspensions contain insoluble solid particles dispersed throughout an aqueous vehicle. According to Stokes' law, the physical sedimentation rate of these dispersed particles is inversely proportional to the absolute viscosity of the continuous phase.

Solution:

- (a) To prevent rapid settling and cake formation in a deflocculated suspension, formulators must increase the internal flow resistance of the liquid vehicle.
- (b) Hydrophilic cellulose polymers, such as methylcellulose or sodium carboxymethylcellulose, act as highly effective thickening and viscosity-modifying agents.
- (c) When dissolved, these polymers form an interlaced molecular network that traps water molecules, increasing the viscosity of the vehicle.
- (d) This increased viscosity slows down particle sedimentation, helping ensure uniform drug distribution during dosing.
- (e) Sodium chloride acts as an electrolyte that alters the zeta potential to promote flocculation, rather than increasing vehicle viscosity.
- (f) Polysorbate 80 functions as a surface-active wetting agent to improve particle dispersion, while lactose monohydrate serves as a soluble crystalline diluent.

Final Answer: Methylcellulose or Sodium carboxymethylcellulose

Answer: (B)

[Go Back to Question 49](#)



Q50.

Solution**Concept:**

Crude drug macroscopy and morphology classify crude herbal bark drugs based on the physical processing methods applied during collection. Bark tissues include all tissues formed outside the active cambium ring in woody plant stems. Post-harvest preparation steps can alter the outermost histological layers, changing the commercial description of the material.

Solution:

- (a) Natural bark consists of several distinct layers, including the outermost protective cork, the cortex, and the inner phloem channels.
- (b) During post-harvest processing, workers frequently use sharp blades to shave or scrape away the rough, weathered outer cork and cortex layers.
- (c) This physical peeling process removes the cork cells completely, exposing the smoother phloem tissues beneath.
- (d) Barks that undergo this specific processing step are formally classified as scraped or peeled barks in pharmacognosic monographs.
- (e) Quills represent barks that have curled inward symmetrically during air-drying, which can occur with either peeled or unpeeled specimens.
- (f) Flat unpeeled barks retain their original outer cork cells and flat shape, showing no signs of mechanical scraping.

Final Answer: Scraped or peeled bark

Answer: (B)

[Go Back to Question 50](#)



Q51.

Solution**Concept:**

Medical prescriptions frequently utilize standardized abbreviations derived from traditional Latin terminology to communicate precise dosing directions cleanly. These shorthand expressions act as a universal vocabulary among physicians, clinical pharmacists, and nursing staff. Understanding these root terms is essential to prevent operational medication distribution errors and ensure proper patient compliance instructions.

Solution:

- (a) The abbreviation t.i.d. originates directly from the classical Latin phrase "ter in die."
- (b) Translating this linguistic root word into modern medical terms yields the operational instruction "three times a day."
- (c) When processing this instruction, a clinical pharmacist advises the patient to space their doses evenly across waking hours, such as morning, afternoon, and evening.
- (d) Other standard frequency shorthand terms include o.d. for "omne in die" (once daily) and b.i.d. for "bis in die" (twice daily).
- (e) The term q.i.d. translates to "quater in die," instructing the patient to take the medication four times each day.
- (f) Accurately interpreting these abbreviations helps ensure precise therapeutic delivery intervals and reduces the risk of accidental overdoses.

Final Answer: To be taken three times a day

Answer: (B)

[Go Back to Question 51](#)



Q52.

Solution**Concept:**

Family welfare and public health campaigns evaluate temporary contraceptive methods based on user compliance, prevention efficacy, and secondary health benefits. While several hormonal and mechanical options effectively prevent conception, individual methods vary significantly in their structural barrier capabilities. Preventing pathogen transmission across mucosal boundaries requires a physical block.

Solution:

- (a) Latex condoms function as a mechanical, impermeable barrier that covers mucosal tissue surfaces during intercourse.
- (b) This physical barrier blocks the transfer of semen and infectious bodily fluids, preventing sperm from accessing the cervical canal.
- (c) By preventing direct contact between mucosal membranes, condoms also block the transmission of pathogens like HIV, chlamydia, and gonorrhea.
- (d) Combined oral contraceptive pills, intrauterine devices, and progestin implants use hormonal or chemical mechanisms to alter ovulation and cervical mucus.
- (e) While these hormonal methods offer high contraceptive efficacy, they lack physical barrier properties and do not protect against sexually transmitted infections.

Final Answer: Male or female latex condoms

Answer: (C)

[Go Back to Question 52](#)



Q53.

Solution**Concept:**

Pharmaceutical compounding uses colligative properties to formulate liquid preparations that match the osmotic pressure of body fluids. Freezing point depression is a colligative property that depends purely on the total concentration of dissolved solute particles in a solution. Matching these values prevents osmotic shock and localized tissue irritation during administration.

Solution:

- (a) Physiological fluids, including human blood plasma and lacrimal secretions, exhibit a constant osmotic pressure due to their dissolved electrolytes and proteins.
- (b) This physiological solute concentration consistently depresses the freezing point of the aqueous biological solution down to exactly -0.52°C .
- (c) To ensure a nasal or ophthalmic formulation is isotonic, its solute concentration must match this freezing point depression value.
- (d) Formulators calculate the required amounts of tonicity adjusting agents, like sodium chloride, to reach this target value of -0.52°C .
- (e) Formulations with a freezing point depression of 0.00°C are hypotonic, which can cause cells to swell and burst upon contact.

Final Answer: -0.52°C **Answer: (B)**[Go Back to Question 53](#)

Q54.

Solution**Concept:**

Reaction mechanisms in organic chemistry are classified by their kinetic behaviors, structural transitions, and intermediate stability profiles. Nucleophilic substitutions at saturated carbon centers typically follow one of two primary pathways depending on substrate structure and reaction conditions. Substrates that can form stable carbocation intermediates follow a distinct stepwise pathway.

Solution:

- (a) Unimolecular nucleophilic substitution (S_N1) reactions proceed via a stepwise mechanism that begins with the slow dissociation of the leaving group.
- (b) Tertiary alkyl halides readily undergo this dissociation because the resulting carbocation intermediate is stabilized by hyperconjugation and inductive effects from surrounding alkyl groups.
- (c) Because carbocation formation is the slow, rate-determining step, the reaction rate depends solely on the concentration of the alkyl halide substrate.
- (d) A weak nucleophile in a polar protic solvent then attacks this planar carbocation intermediate to complete the substitution process.
- (e) Bimolecular substitution (S_N2) reactions proceed via a single, concerted step where the nucleophile attacks from the backside as the leaving group departs.

Final Answer: Unimolecular Nucleophilic Substitution (S_N1)

Answer: (B)

[Go Back to Question 54](#)



Q55.

Solution**Concept:**

Pharmaceutical stability programs evaluate chemical degradation pathways to optimize storage conditions and maximize product shelf life. Many therapeutic compounds contain vulnerable functional groups that react with environmental factors like moisture, light, or oxygen. Controlling these environmental variables prevents premature chemical breakdown and loss of potency.

Solution:

- (a) Hydrolysis is a major degradation pathway where water molecules attack vulnerable covalent bonds, such as esters, amides, and lactams.
- (b) Ambient moisture and relative humidity in storage areas can accelerate this hydrolytic breakdown, compromising product integrity.
- (c) Installing industrial dehumidifiers and using tightly sealed containers reduces moisture exposure, protecting hydrolytically unstable drugs.
- (d) Photolysis involves light-driven degradation pathways, which are typically managed using amber glass or opaque outer packaging.
- (e) Polymerization and isomerization represent structural rearrangements triggered by thermal energy or pH shifts rather than moisture exposure.

Final Answer: Hydrolysis

Answer: (A)

[Go Back to Question 55](#)



Q56.

Solution**Concept:**

Human physiology relies on integrated organ systems to maintain homeostatic gas exchange and deliver vital nutrients to peripheral tissues. External respiration introduces oxygen into the bloodstream, where it binds to hemoglobin molecules inside specialized red blood cells. Transporting these oxygenated cells to working tissues requires a continuous, pressurized distribution network.

Solution:

- (a) The cardiovascular system serves as the primary transport network of the body, powered by the coordinated pumping action of the heart.
- (b) This system propels erythrocytes through an organized network of arteries, capillaries, and veins to reach every tissue bed.
- (c) Red blood cells carry hemoglobin, a specialized iron-bearing metalloprotein that binds oxygen in the lungs and releases it into peripheral tissues.
- (d) Anemias that lower hemoglobin or hematocrit levels compromise the oxygen-carrying capacity of this transport network.
- (e) The lymphatic system manages interstitial fluid balance and immune cell transport, but does not drive systemic oxygen distribution.

Final Answer: Cardiovascular System

Answer: (B)

[Go Back to Question 56](#)



Q57.

Solution**Concept:**

Clinical pharmacy guidelines prioritize effective patient communication during medication dispensing to improve treatment outcomes. Providing comprehensive verbal and written information helps bridge the gap between clinical intent and actual patient behavior. This educational outreach directly targets common failure points in outpatient care.

Solution:

- (a) Patient counseling provides individuals with essential information regarding proper dosing schedules, potential side effects, and correct storage methods.
- (b) Clear communication helps patients understand their treatment plans, which enhances adherence to long-term drug regimens.
- (c) Clarifying complex instructions and warning against common drug interactions also helps minimize medication errors at home.
- (d) This educational support complements the role of the prescribing physician, helping ensure the treatment plan is executed safely.
- (e) Patient counseling focuses on optimizing therapeutic outcomes and patient safety, rather than maximizing retail profits or altering legal liability frameworks.

Final Answer: Enhance patient adherence to the prescribed drug regimen and minimize medication errors

Answer: (C)

[Go Back to Question 57](#)



Q58.

Solution**Concept:**

Clinical lipidology evaluates circulating lipoprotein particles to estimate cardiovascular disease risks and track atherogenic processes. Lipoproteins vary in density, protein content, and lipid composition, which dictates how they interact with vascular endothelial walls. Certain pathways deliver cholesterol to peripheral tissues, while others return it to the liver.

Solution:

- (a) High-density lipoprotein (HDL) particles facilitate reverse cholesterol transport by clearing excess cholesterol from peripheral tissues and blood vessels.
- (b) HDL shuttles these collected lipids back to hepatic tissues for excretion as bile acids, helping prevent cholesterol accumulation in arterial walls.
- (c) This clearance mechanism helps prevent the formation of fatty streaks and atherosclerotic plaques within the vascular endothelium.
- (d) Clinical studies confirm that high circulating levels of HDL serve as an independent marker for a reduced risk of coronary artery disease.
- (e) Low-density lipoproteins (LDL) and very low-density lipoproteins (VLDL) deliver lipids to peripheral tissues, and elevated levels can promote atherogenesis.

Final Answer: High-Density Lipoprotein (HDL)

Answer: (C)

[Go Back to Question 58](#)



Q59.

Solution**Concept:**

Forensic toxicology and jurisprudence utilize statutory legal frameworks to regulate substances with high abuse liabilities or dependency risks. National legislation establishes strict control measures for the import, manufacture, sale, and possession of restricted compounds. These laws impose severe penalties to deter illicit drug trafficking and misuse.

Solution:

- (a) The Narcotic Drugs and Psychotropic Substances (NDPS) Act of 1985 provides the primary legal framework for controlling restricted substances across India.
- (b) This statutory law regulates potent narcotics and psychotropic materials that carry high risks of physiological dependence and addiction.
- (c) The NDPS Act establishes strict guidelines for lawful medical use while imposing severe criminal penalties for unauthorized possession or distribution.
- (d) The Pharmacy Act of 1948 regulates the profession of pharmacy, while the Poisons Act of 1919 controls the storage and sale of specific industrial poisons.
- (e) The Drugs and Magic Remedies Act of 1954 prohibits misleading advertisements regarding the curative properties of certain medicines.

Final Answer: The Narcotic Drugs and Psychotropic Substances (NDPS) Act, 1985

Answer: (C)

[Go Back to Question 59](#)



Q60.

Solution**Concept:**

Oncology pharmacology uses rescue strategies to protect healthy host tissues from the toxic effects of high-dose antimetabolite chemotherapy. Antimetabolites disrupt essential biochemical pathways, such as nucleic acid synthesis, in rapidly dividing cells. Administering a downstream metabolite helps restore essential cofactors in normal cells after chemotherapy.

Solution:

- (a) Methotrexate is an antimetabolite that inhibits dihydrofolate reductase (DHFR), the enzyme responsible for converting dihydrofolate to tetrahydrofolate.
- (b) This inhibition blocks the synthesis of thymidylate and purines, preventing DNA replication and cell division in rapidly proliferating tissues.
- (c) High-dose therapy can cause severe toxicity in healthy host tissues, such as the bone marrow and gastrointestinal mucosa.
- (d) Leucovorin, or folinic acid, is a reduced folate derivative that enters cells via active transport without requiring functional DHFR enzymes.
- (e) Once inside, it converts into active tetrahydrofolate cofactors, bypassing the blocked enzyme to rescue normal cells from functional folate deficiencies.

Final Answer: Tetrahydrofolate depletion caused by the inhibition of dihydrofolate reductase

Answer: (B)

[Go Back to Question 60](#)



Q61.

Solution**Concept:**

Pharmaceutical engineering and unit operations rely on mechanical particle separation techniques to handle solid dosage forms. After a wet granulation process, the resulting material contains an uneven distribution of coarse aggregates and fine powders. Achieving particle size uniformity requires mechanical methods that utilize physical size barriers and systematic agitation.

Solution:

- (a) Mechanical size separation frequently relies on passing a heterogeneous mixture over a calibrated mesh or screen surface.
- (b) A sieve shaker utilizes a steady horizontal oscillatory or gyratory motion to distribute granules across the screen area.
- (c) This continuous movement causes smaller particles to pass down through the mesh openings, leaving larger aggregates behind.
- (d) An oscillating granulator uses a similar mechanical motion to force wet or dry mass through a screen for sizing.
- (e) A cyclone separator relies on centrifugal vortex air streams rather than mechanical mesh screens to classify fine particles.
- (f) Fluidized bed dryers use upward air currents to suspend particles, while double cone blenders tumble materials to achieve uniform blending.

Final Answer: Sieve Shaker or Oscillating Granulator

Answer: (B)

[Go Back to Question 61](#)



Q62.

Solution**Concept:**

Membrane biology defines the structural and thermodynamic properties that regulate molecular transport across cellular boundaries. Biological interfaces consist of amphipathic molecules that organize spontaneously into bilayers when exposed to aqueous environments. This dynamic structural framework is best explained by models that describe the lateral mobility of its components.

Solution:

- (a) The structural block diagram illustrates an amphipathic lipid bilayer matrix interspersed with integral and peripheral proteins.
- (b) This arrangement matches the fluid mosaic model developed by Singer and Nicolson to describe plasma membrane architecture.
- (c) The lipid core forms a fluid, dynamic bilayer matrix that allows embedded lipid and protein molecules to move laterally.
- (d) Integral proteins span the hydrophobic core, while peripheral proteins associate loosely with the inner or outer hydrophilic surfaces.
- (e) The unit membrane concept proposed a rigid, static sandwich structure that does not account for this observed lateral mobility.
- (f) Micellar aggregates form simple spherical monolayers, whereas liposomes represent synthetic concentric vesicles rather than natural plasma membranes.

Final Answer: Fluid Mosaic Model of the Plasma Membrane

Answer: (B)

[Go Back to Question 62](#)



Q63.

Solution**Concept:**

Pharmacognosic anatomy evaluates the diagnostic microscopic features of crude leaf drugs to verify their authenticity and identify adulterants. Leaf monographs document the specific arrangements of epidermal cells, stomatal complexes, trichome types, and crystalline inclusions. Examining these microscopic structures under a microscope provides a reliable method for identifying powdered or whole crude drugs.

Solution:

- (a) *Digitalis purpurea* leaves feature characteristic uniseriate non-glandular trichomes alongside anomocytic stomata, where neighboring cells resemble general epidermal cells.
- (b) The lamina tissues of *Digitalis purpurea* are also characterized by the absolute absence of calcium oxalate crystals.
- (c) *Atropa belladonna* leaves contain microsphenoidal sandy crystals of calcium oxalate rather than distinct rosette crystal structures.
- (d) *Senna alexandrina* leaflets are characterized by paracytic stomata and a prominent arrangement of calcium oxalate prisms and cluster crystals.
- (e) *Mentha piperita* leaves primarily feature distinct, capitate glandular trichomes filled with volatile oils rather than prominent rosette crystals.

Final Answer: *Digitalis purpurea*

Answer: (A)

[Go Back to Question 63](#)



Q64.

Solution**Concept:**

Quality control protocols utilize characteristic physical constants to verify the purity, identity, and crystalline structure of raw materials. The thermal behavior of an anhydrous solid chemical substance under standard atmospheric pressure reflects its underlying molecular arrangement. Pure crystalline compounds demonstrate sharp, reproducible phase transition parameters during controlled heating.

Solution:

- (a) The melting point represents the precise temperature at which a crystalline solid transitions completely into a clear liquid phase.
- (b) At this specific temperature, the thermal energy introduced overcomes the cohesive intermolecular forces holding the crystal lattice together.
- (c) Pure chemical substances exhibit a sharp melting point range, whereas the presence of impurities lowers and broadens this range.
- (d) Measuring the melting point configuration provides a reliable physical parameter for evaluating raw material identity and purity.
- (e) Boiling point profiles apply to liquid-to-gas transitions, while optical rotation angles quantify how a substance interacts with polarized light.
- (f) The refractive index measures the bending of a light beam as it passes across a phase boundary into a liquid medium.

Final Answer: Melting point configuration

Answer: (C)

[Go Back to Question 64](#)



Q65.

Solution**Concept:**

Clinical pharmacology monitors toxicological drug interactions that occur when therapeutic agents are combined with specific dietary intake profiles. Non-selective monoamine oxidase (MAO) inhibitors prevent the breakdown of biogenic amines within both the central nervous system and peripheral tissues. Blocking these metabolic enzymes leaves the body vulnerable to vasoactive compounds found in fermented foods.

Solution:

- (a) Tyramine is a potent sympathomimetic amine found in high concentrations within fermented foods like aged cheeses, red wines, and cured meats.
- (b) Under normal conditions, monoamine oxidase enzymes in the gastrointestinal tract and liver rapidly metabolize ingested tyramine.
- (c) When a patient takes a non-selective MAO inhibitor, this protective metabolic breakdown pathway is effectively blocked.
- (d) The un-metabolized tyramine enters the systemic circulation and displaces large amounts of norepinephrine from peripheral sympathetic nerve terminals.
- (e) This sudden release of norepinephrine causes severe vasoconstriction, triggering a life-threatening hypertensive episode known as the cheese reaction.
- (f) This severe food-drug interaction represents a pharmacodynamic mismatch rather than a physical adsorption or accelerated renal clearance issue.

Final Answer: Pharmacodynamic food-drug interaction (the "cheese reaction")

Answer: (B)

[Go Back to Question 65](#)



Q66.

Solution**Concept:**

Histology classifies human skeletal tissues by the organization of their extracellular matrix, cell lineages, and vascular networks. Mature compact bone tissue is structured into an organized network of cylindrical units designed to withstand mechanical stress. These structural units contain concentric mineralized rings arranged around a central macroscopic canal that houses neurovascular structures.

Solution:

- (a) Compact bone tissue is composed of repeating structural units called osteons, or Haversian systems.
- (b) Each osteon features a central Haversian canal that contains blood vessels, lymphatic channels, and nerve fibers to sustain the tissue.
- (c) This central canal is surrounded by concentric rings of calcified extracellular matrix called lamellae.
- (d) Mature bone cells, or osteocytes, reside within small spaces called lacunae distributed between these concentric lamellar rings.
- (e) Hyaline cartilage features a flexible collagenous matrix containing chondrocytes, but lacks organized Haversian canals or concentric bony lamellae.
- (f) Dense irregular connective tissue contains scattered collagen bundles, while smooth muscle forms an unstriated visceral syncytium.

Final Answer: Compact bone (Osteon or Haversian system)

Answer: (B)

[Go Back to Question 66](#)



Q67.

Solution**Concept:**

Pharmacy legislation and regulatory frameworks classify medications into distinct schedules based on their safety profiles, abuse potential, and distribution methods. Certain therapeutic agents carry a wide margin of safety and low toxicity risks when used according to package directions. These qualities allow regulatory bodies to make these products more accessible to consumers.

Solution:

- (a) Over-the-counter (OTC) medications are defined by their legal status, which permits direct consumer purchase without a prescription.
- (b) Regulatory agencies approve these drugs for self-limiting conditions because their instructions are clear enough for consumers to follow safely without professional oversight.
- (c) These products can be sold directly to consumers by retail outlets, without requiring a prescription from a registered medical practitioner.
- (d) OTC status does not require institutional hospital monitoring or restrict distribution exclusively to state-run pharmacies.
- (e) Potent narcotic agents and highly toxic substances are restricted under tight schedules and require explicit medical oversight to prevent harm.

Final Answer: It is legally permitted to be sold consumer-direct without requiring a prescription from a registered medical practitioner.

Answer: (B)

[Go Back to Question 67](#)



Q68.

Solution**Concept:**

Biochemical analysis organizes macromolecular protein architecture into four hierarchical levels based on folding patterns and stabilizing chemical bonds. The initial linear sequence of amino acids undergoes regional folding driven by localized interactions along the polypeptide backbone. This regional folding produces highly ordered structural patterns.

Solution:

- (a) The secondary structure of a protein refers to regular, repeating folding patterns established within a single polypeptide chain.
- (b) This structural level is stabilized primarily by hydrogen bonds between carbonyl oxygen atoms and amide hydrogen atoms along the peptide backbone.
- (c) Common examples of secondary structures include the tightly coiled α -helix and the extended, sheet-like β -pleated sheet configuration.
- (d) The primary structure is defined solely by the covalent peptide bonds that link sequential amino acids together in a linear chain.
- (e) Tertiary structure describes the overall three-dimensional folding of a single polypeptide, stabilized primarily by side-chain interactions.
- (f) Quaternary structure refers to the spatial arrangement and assembly of multiple independent polypeptide subunits into a functional multi-subunit complex.

Final Answer: Secondary structure (α -helix or β -pleated sheet)

Answer: (B)

[Go Back to Question 68](#)



Q69.

Solution**Concept:**

Clinical pharmacokinetics adjusts dosing regimens for geriatric populations to account for age-related declines in organ function. Cardiac glycosides like digoxin have a narrow therapeutic index and rely heavily on renal elimination to clear active drug from the body. Impaired renal clearance can lead to accumulation of the drug, increasing the risk of systemic toxicity.

Solution:

- (a) Geriatric patients frequently experience a gradual decline in glomerular filtration rate, which reduces the clearance of renally eliminated drugs.
- (b) Cardiac glycosides exhibit a narrow therapeutic index, meaning small changes in serum concentration can lead to severe toxicities.
- (c) If a patient with reduced renal function receives standard adult doses, the drug can accumulate and cause digitalis toxicity.
- (d) To prevent this, the pharmacist should recommend an adjusted lower maintenance dose based on the patient's calculated creatinine clearance.
- (e) Increasing the dose or switching to a rapid intravenous bolus would dramatically increase the risk of severe arrhythmias.
- (f) Administering calcium infusions concurrently can dangerously potentiate the toxic effects of cardiac glycosides on myocardial tissues.

Final Answer: Suggest an adjusted lower maintenance dose based on calculated creatinine clearance values.

Answer: (B)

[Go Back to Question 69](#)



Q70.

Solution**Concept:**

Organic nomenclature rules established by the International Union of Pure and Applied Chemistry (IUPAC) provide a systematic approach to naming structural compounds. Naming an aliphatic alcohol requires identifying the longest continuous carbon chain that contains the principal hydroxyl functional group. Numbering the chain from the end closest to the hydroxyl group ensures the functional group receives the lowest possible locant.

Solution:

- (a) The chemical structure $\text{CH}_3 - \text{CH}(\text{OH}) - \text{CH}_2 - \text{CH}_3$ contains a straight chain of four continuous carbon atoms, which corresponds to the parent alkane butane.
- (b) The principal functional group is a hydroxyl ($-\text{OH}$) group, indicating that the compound is an alcohol and will take the suffix "-ol".
- (c) Numbering the four-carbon chain from left to right places the hydroxyl group on carbon number 2, which gives it the lowest possible locant.
- (d) Combining these steps yields the systematic IUPAC name butan-2-ol for this secondary alcohol structure.
- (e) Butan-1-ol describes a straight four-carbon chain with the hydroxyl group located on terminal carbon number 1.
- (f) Propan-2-ol is a three-carbon alcohol structure, whereas 2-methylpropan-1-ol features a branched four-carbon skeleton with a primary alcohol group.

Final Answer: Butan-2-ol

Answer: (B)

[Go Back to Question 70](#)



Q71.

Solution**Concept:**

Pharmacognosic evaluation includes several methods to detect fraud, maintain quality control, and ensure the identity of crude botanical products. Adulteration is the intentional or accidental substitution of the original plant material with inferior, inactive, or altered substances. Understanding these classification profiles helps regulatory analysts target specific macroscopic or microscopic variations in commercial drug shipments.

Solution:

- (a) Evaluation of crude drug batches can reveal a fraudulent practice known as intentional adulteration using exhausted material.
- (b) This occurs when the active chemical constituents are extracted from a genuine botanical drug, leaving behind an inert plant matrix.
- (c) This exhausted vegetable waste material is dried, processed, and intentionally mixed into fresh, genuine drug supplies to increase profit margins.
- (d) Because the exhausted material shares the same macroscopic structures as the authentic drug, visual detection is extremely difficult without chemical profiling.
- (e) Accidental microbial contamination involves poor storage conditions, whereas natural geographical variation reflects normal environmental adaptations without human intervention.
- (f) Cultivation optimization divergence describes variations resulting from agricultural shifts, rather than the deliberate reuse of spent plant tissue layers.

Final Answer: Intentional adulteration using exhausted drug material

Answer: (A)

[Go Back to Question 71](#)



Q72.

Solution**Concept:**

Human anatomy organizes specialized physiological structures into major organ systems to coordinate systematic chemical signaling and metabolic homeostasis. Regulating the baseline rate of cellular energy consumption requires hormones synthesized by a prominent branch of the signaling network. These signaling molecules travel through the systemic bloodstream to act on distant target tissues.

Solution:

- (a) The endocrine system consists of ductless glands that synthesize and secrete specialized chemical messengers directly into the bloodstream.
- (b) The thyroid gland is a major endocrine organ that utilizes systemic iodine to produce thyroxine (T_4) and triiodothyronine (T_3).
- (c) These circulating thyroid hormones act on multiple tissues to regulate cellular respiration, protein synthesis, and basal metabolic rate.
- (d) Autoimmune disorders like Graves' disease cause an overproduction of these hormones, resulting in systemic hypermetabolism and weight loss.
- (e) The exocrine pancreatic system secretes digestive enzymes through ducts, which functions separately from systemic endocrine metabolic regulation.
- (f) The integumentary matrix provides protective structural boundaries, while the musculoskeletal motor system drives physical movement rather than systemic metabolic signaling.

Final Answer: Endocrine System

Answer: (B)

[Go Back to Question 72](#)



Q73.

Solution**Concept:**

The development of pharmaceutical legislation in India is rooted in historical committee reports commissioned to assess public health frameworks. During the early twentieth century, unregulated markets led to the widespread distribution of low-quality, subcompensated imported medicines. Resolving these issues required formal legislative reviews to establish quality controls and education standards.

Solution:

- (a) In 1930, the Indian Government appointed the Drugs Enquiry Committee under the leadership of Colonel R. N. Chopra.
- (b) Widely recognized as the Chopra Committee, this body investigated the quality and purity of imported pharmaceutical products.
- (c) The committee recommended creating a central drug control laboratory and implementing structured pharmacy training programs across the country.
- (d) The findings of the Chopra Committee served as the basis for drafting the landmark Drugs and Cosmetics Act of 1940.
- (e) The Bhore Committee focused on general health survey and development planning, whereas the Hathi Committee evaluated essential drug lists.
- (f) The Mudaliar Committee followed decades later to review broader health survey structures rather than early pharmacy legislation frameworks.

Final Answer: Chopra Committee (Drugs Enquiry Committee)

Answer: (B)

[Go Back to Question 73](#)



Q74.

Solution**Concept:**

Industrial manufacturing lines rely on precise engineering controls to prepare bulk volumes of sterile, high-purity Water for Injection (WFI). Compendial standards mandate the absolute elimination of chemical solutes, volatile fractions, and pyrogenic bacterial endotoxins. Selecting an optimal production apparatus requires thermal technologies capable of consistently separating these fractions under continuous operation.

Solution:

- (a) Water for Injection must meet strict regulatory limits to ensure it is free from non-volatile solutes and heat-stable bacterial lipopolysaccharides.
- (b) Multi-effect distillation stills utilize a series of evaporators operated at sequentially lower pressures to maximize thermal efficiency.
- (c) This closed, multistage distillation process vaporizes water while leaving behind heavy endotoxin matrices and non-volatile chemical compounds.
- (d) Simple glass flask distillation units are limited to small-scale laboratory settings and lack the validation controls required for industrial production.
- (e) Fluidized bed setups are designed for drying solid granules, whereas open-surface solar pans are vulnerable to extensive environmental contamination.

Final Answer: Multi-effect distillation still matching compendial parameters

Answer: (B)

[Go Back to Question 74](#)



Q75.

Solution**Concept:**

Clinical psychopharmacology classifies therapeutic antihistamines into distinct generations based on their chemical structures and tissue distribution profiles. Histamine-1 (H_1) receptor antagonists are commonly used to treat localized hypersensitivity reactions like allergic rhinitis. Minimizing systemic side effects requires structural modifications that prevent entry into protected physiological compartments.

Solution:

- (a) First-generation H_1 -antihistamines like diphenhydramine are highly lipophilic molecules that readily cross the blood-brain barrier into central nervous tissues.
- (b) Once inside the central nervous system, blocking central H_1 receptors causes pronounced drowsiness, sedation, and impaired coordination.
- (c) Second-generation antihistamines like cetirizine and loratadine feature bulky, less lipophilic chemical modifications that reduce central nervous system penetration.
- (d) These structural properties keep the drug concentrated in peripheral tissues, providing effective allergy relief with minimal sedation.
- (e) Neither generation acts as an irreversible antagonist of peripheral β_2 receptors or completely avoids hepatic first-pass clearance pathways.

Final Answer: Minimal central nervous system penetration, resulting in significantly lower sedation liability

Answer: (B)

[Go Back to Question 75](#)



Q76.

Solution**Concept:**

Analytical limit tests utilize colorimetric and gaseous reactions to detect trace heavy metal contaminants within raw chemical inputs. The official limit test for arsenic uses a standardized Gutzeit apparatus to generate and capture volatile hydride gases. Evaluating sample compliance requires exposing this gas to a chemical reagent that produces a quantifiable color change.

Solution:

- (a) The Gutzeit apparatus uses a chemical reaction to convert any arsenic present in the sample into volatile arsenious gas (AsH_3).
- (b) This liberated arsine gas ascends through a glass tube packed with cotton wool soaked in lead acetate solution.
- (c) The lead acetate cotton filters out hydrogen sulfide gas impurities, which could otherwise interfere with the analytical results.
- (d) The arsine gas then contacts a piece of test paper sensitized with mercuric chloride solution.
- (e) This reaction produces a yellow-to-brown stain, and the intensity of the color is compared against standard references to determine compliance.
- (f) Barium chloride and silver nitrate solutions are used in other limit tests to detect sulfate and chloride impurities, respectively.

Final Answer: Mercuric chloride paper

Answer: (B)

[Go Back to Question 76](#)



Q77.

Solution**Concept:**

Phytochemistry and pharmacognosy classify secondary metabolites based on their chemical ring skeletons and therapeutic profiles. Many medicinal root drugs produce complex nitrogenous compounds that exert potent physiological effects on human cardiovascular and neurological systems. Identifying the principal active compound is essential for standardizing botanical extracts.

Solution:

- (a) The dried roots of *Rauwolfia serpentina*, commonly known as Sarpagandha, contain a rich mixture of specialized indole alkaloids.
- (b) Reserpine is the principal indole alkaloid responsible for the characteristic therapeutic profile of this crude drug.
- (c) Mechanistically, reserpine inhibits vesicular monoamine transporters (VMAT), depleting peripheral and central stores of norepinephrine, serotonin, and dopamine.
- (d) This depletion of monoamines slows heart rate and lowers peripheral vascular resistance, making it an effective treatment for hypertension.
- (e) Quinine is a cinchona-derived quinoline alkaloid, while strychnine functions as a highly toxic central nervous system stimulant isolated from nux vomica seeds.
- (f) Atropine is a tropane alkaloid found in solanaceous leaves like belladonna, which acts as a competitive antagonist at muscarinic receptors.

Final Answer: Reserpine

Answer: (B)

[Go Back to Question 77](#)



Q78.

Solution**Concept:**

Renal physiology monitors transport mechanisms across the epithelial cells of the nephron to manage systemic fluid balance and electrolyte concentrations. Different segments of the nephron feature unique structural specializations and water permeability characteristics. Loop diuretics target specific ion cotransporters located in water-impermeable sections of the nephron.

Solution:

- (a) The loop of Henle features distinct descending and ascending segments that work together to create an osmotic gradient in the renal medulla.
- (b) The thick ascending limb (TAL), labeled as Region Y, is completely impermeable to water molecules due to its tight cellular junctions.
- (c) The epithelial cells in this region express $\text{Na}^+/\text{K}^+/\text{2Cl}^-$ cotransporters, which actively reabsorb ions from the tubular fluid.
- (d) This active ion transport without parallel water movement dilutes the urine, making this segment a key site of action for loop diuretics.
- (e) Loop diuretics like furosemide bind directly to these cotransporters, blocking ion reabsorption and increasing urine output.
- (f) The proximal tubule reabsorbs water along with solutes, while the thin descending limb is highly permeable to water molecules.

Final Answer: Thick Ascending Limb of the Loop of Henle

Answer: (B)

[Go Back to Question 78](#)



Q79.

Solution**Concept:**

Electrophilic aromatic substitution describes the mechanism by which an electron-rich aromatic ring reacts with a strong electron-deficient intermediate. Nitrating a benzene ring requires a strong mineral acid mixture to generate a powerful electrophile in situ. This electrophilic intermediate is required to disrupt the aromatic resonance stability during the initial addition step.

Solution:

- (a) The nitration of benzene utilizes a mixture of concentrated nitric acid (HNO_3) and concentrated sulfuric acid (H_2SO_4).
- (b) In this acid mixture, concentrated sulfuric acid acts as a strong proton donor, protonating the hydroxyl group of the nitric acid molecule.
- (c) This protonated intermediate then loses a water molecule, generating a highly reactive, electron-deficient nitronium ion (NO_2^+).
- (d) The nitronium ion serves as the primary electrophile that undergoes attack by the π -electron cloud of the benzene ring.
- (e) Nitrite anions represent nucleophilic species, while nitrate radicals and neutral nitrogen dioxide molecules do not drive this electrophilic substitution pathway.

Final Answer: Nitronium ion (NO_2^+)

Answer: (B)

Go Back to Question 79



Q80.

Solution**Concept:**

Epidemiological programs design community interventions based on the transmission vectors and environmental reservoirs of target pathogens. Outbreaks of vector-borne viral illnesses like Dengue and Chikungunya are closely tied to the life cycles of their primary insect vectors. Long-term prevention strategies focus on disrupting these insect populations at critical stages of development.

Solution:

- (a) Dengue and Chikungunya viruses are transmitted to humans through the bites of infected female mosquitoes belonging to the genus *Aedes*.
- (b) *Aedes* mosquitoes preferentially lay their eggs in clean, stagnant water collections found in urban and peri-urban environments.
- (c) Typical breeding sites include open water storage tanks, discarded tires, flower pots, and uncovered drainage channels.
- (d) Public health campaigns focus on eliminating these stagnant water sources to disrupt the mosquito life cycle and reduce vector density.
- (e) Eradicating wild rodent populations targets flea-borne or hantavirus reservoirs, while pasteurization protocols prevent milk-borne bacterial transmissions.
- (f) Medical waste incineration prevents accidental blood-borne exposure in clinical settings, but does not alter external mosquito breeding cycles.

Final Answer: Elimination of stagnant water breeding sites for *Aedes* mosquitoes

Answer: (B)

[Go Back to Question 80](#)



Q81.

Solution**Concept:**

Store and inventory management relies on administrative control frameworks to automate supply chains, optimize capital, and ensure uninterrupted stock availability. In institutional pharmacies, manually checking stock levels is inefficient and increases the risk of supply stockouts. Automated inventory systems track material consumption against delivery lead times to calculate precise computational triggers for automated replenishment cycles.

Solution:

- (a) The reorder point represents the minimum inventory level of an essential drug that signals the need to issue a new purchase order.
- (b) Calculating this threshold requires analyzing the average daily usage rate of the stock item alongside its supplier lead time.
- (c) Lead time represents the total time delay between initializing a purchase order and receiving the physical stock at the depot.
- (d) When inventory drops to this threshold, the system automatically triggers a replenishment order to prevent stock depletion during the lead time.
- (e) Maximum stock buffer levels define upper inventory limits to prevent overstocking and reduce the amount of locked-up capital.
- (f) Economic safety margins provide a separate safety stock buffer, while dead stock valuation indices analyze entirely stagnant inventory items.

Final Answer: Reorder Point (ROP)

Answer: (A)

[Go Back to Question 81](#)



Q82.

Solution**Concept:**

The Narcotic Drugs and Psychotropic Substances Act of 1985 establishes legal controls to prevent the illicit diversion of high-dependence substances. Cultivating botanical sources of narcotics, such as the opium poppy, requires strict regulatory supervision to balance medical production needs against criminal prevention. This oversight is maintained by assigning licensing powers exclusively to specialized statutory offices.

Solution:

- (a) The cultivation of *Papaver somniferum* is restricted under national security legislation to prevent the diversion of raw opium into illicit markets.
- (b) Under the statutory provisions of the Act, the Narcotics Commissioner holds the administrative authority to oversee this sector.
- (c) The Narcotics Commissioner defines the specific geographical zones where opium cultivation is legally permitted each year.
- (d) This officer issues individual cultivation licenses and oversees the mandatory collection and processing of raw opium gum harvests.
- (e) State Pharmacy Councils manage local professional registrations and education standards, rather than federal narcotic cultivation frameworks.
- (f) Local municipal officers handle regional urban sanitation, while the Drugs Controller General of India oversees finished product approvals.

Final Answer: The Narcotics Commissioner appointed by the Central Government

Answer: (B)

[Go Back to Question 82](#)



Q83.

Solution**Concept:**

Clinical pharmacology manages metabolic disorders by matching specific oral hypoglycemic agents with their underlying cellular and receptor targets. Type-2 diabetes mellitus is characterized by peripheral insulin resistance across skeletal muscle and adipose tissues. Reversing this resistance requires therapeutic agents that alter gene transcription to improve glucose transport mechanisms.

Solution:

- (a) Thiazolidinediones, commonly known as glitazones, are oral hypoglycemic agents that act as selective ligands for a specific nuclear receptor.
- (b) These drugs bind and activate peroxisome proliferator-activated receptor-gamma, a transcription factor found primarily in adipose and muscle tissues.
- (c) Activating this nuclear receptor modulates the expression of specific genes that regulate glucose utilization and lipid metabolism.
- (d) This gene activation increases the synthesis and translocation of glucose transporters, directly enhancing peripheral insulin sensitivity.
- (e) Sulfonylureas act by blocking adenosine triphosphate-sensitive potassium channels on pancreatic beta cells to stimulate insulin secretion.
- (f) Biguanides primarily reduce hepatic glucose output, whereas alpha-glucosidase inhibitors delay carbohydrate digestion within the intestinal lumen.

Final Answer: Thiazolidinediones (Glitazones)

Answer: (C)

[Go Back to Question 83](#)



Q84.

Solution**Concept:**

Industrial formulation design utilizes chemical and environmental stabilization techniques to protect easily oxidizable therapeutic agents from degradation. Labile pharmaceuticals undergo rapid oxidative breakdown when exposed to ambient atmospheric oxygen during storage. Extending product shelf life requires sealing these sensitive liquid solutions under a chemically inert atmosphere.

Solution:

- (a) Oxidative degradation pathways break down vulnerable functional groups on drug molecules, generating inactive or toxic transformation products.
- (b) This decomposition process is accelerated by exposure to atmospheric oxygen, trace minerals, and thermal energy during manufacturing.
- (c) To prevent this degradation, liquid formulations are filled into glass ampoules under a stream of high-purity inert gas.
- (d) Pure nitrogen gas is typically used to displace atmospheric oxygen from the ampoule headspace immediately before flame-sealing.
- (e) Nitrogen is an ideal choice because it is chemically inert, non-reactive with most pharmaceuticals, and highly cost-effective.
- (f) Carbon dioxide can alter solution pH by forming carbonic acid, while compressed air and nitrous oxide promote oxidative pathways.

Final Answer: Pure Nitrogen gas

Answer: (B)

[Go Back to Question 84](#)



Q85.

Solution**Concept:**

Clinical biochemistry utilizes qualitative colorimetric reagents to screen urine samples for abnormal metabolic products. Pathological conditions like diabetes mellitus can overwhelm renal reabsorption thresholds, leading to the excretion of specific carbohydrates. Detecting these changes relies on redox chemistry between the functional groups of the analyte and alkaline copper complexes.

Solution:

- (a) Benedict's test is a classic diagnostic assay used to detect the presence of reducing sugars in liquid biological samples.
- (b) The reagent contains an alkaline solution of copper sulfate, sodium carbonate, and sodium citrate complexes.
- (c) When heated with a sample containing reducing sugars like glucose, the free aldehyde or ketone groups reduce cupric ions.
- (d) This reduction converts blue cupric ions into insoluble cuprous oxide, which precipitates out as an intense brick-red solid.
- (e) The formation of this brick-red precipitate confirms glucosuria, which is a key diagnostic indicator of poorly controlled diabetes.
- (f) Conjugated bilirubin requires different diazo coupling assays, while high-molecular-weight proteins and ketone bodies utilize alternative diagnostic reagents.

Final Answer: Reducing sugars, such as glucose (glucosuria)

Answer: (B)

[Go Back to Question 85](#)



Q86.

Solution**Concept:**

Emergency medicine manages acute, life-threatening airway constriction using fast-acting systemic bronchodilators. Status asthmaticus causes profound bronchospasm that resists standard beta-2 agonist inhalation therapies. Reversing this severe constriction requires systemic agents that inhibit cyclic nucleotide degradation, thereby relaxing bronchial smooth muscle cells.

Solution:

- (a) Aminophylline is a soluble methylxanthine complex composed of theophylline and ethylenediamine that is administered via intravenous infusion.
- (b) The primary mechanism of action involves the non-selective inhibition of intracellular phosphodiesterase enzymes.
- (c) Phosphodiesterase enzymes are responsible for breaking down the secondary messenger cyclic adenosine monophosphate (cAMP) within smooth muscle cells.
- (d) By blocking this enzyme, aminophylline increases intracellular cAMP levels, activating protein kinases that decrease calcium entry.
- (e) This biochemical pathway relaxes bronchial smooth muscle tissue, reversing severe bronchospasm during acute asthma exacerbations.
- (f) This drug does not activate muscarinic pathways, block peripheral beta-2 receptors, or inhibit endogenous nitric oxide synthesis.

Final Answer: Non-selective inhibition of phosphodiesterase (PDE) enzymes, leading to increased intracellular cyclic AMP levels

Answer: (A)

[Go Back to Question 86](#)



Q87.

Solution**Concept:**

Industrial capsule manufacturing relies on strict quality control parameters to manage the mechanical stability of hard gelatin shells. High-speed automatic filling machines place significant mechanical stress on the capsule cap and body pieces. Preventing structural defects requires maintaining precise physical dimensions and moisture balances during shell production.

Solution:

- (a) Hard gelatin capsule shells consist of two distinct pre-fabricated sections: a longer body and a shorter cap.
- (b) Modern filling lines use mechanical handling steps to separate, fill, and rejoin these two sections at high speeds.
- (c) Splitting or premature separation often points to inadequate dimensions along the interlocking pre-lock rims.
- (d) This defect can also be caused by incorrect moisture content, as shells with less than 13% water become brittle.
- (e) Titanium dioxide is an opacifier used to color shells, and its concentration does not alter mechanical locking alignment.
- (f) Adjusting plasticizer ratios modifies shell flexibility, while low bloom strength gelatin primarily reduces overall wall strength rather than locking mechanics.

Final Answer: Inadequate locking rim dimensions or incorrect moisture content of the shell

Answer: (A)

[Go Back to Question 87](#)



Q88.

Solution**Concept:**

The field of pharmacognosy studies how agricultural environments and seasonal timing affect the accumulation of secondary metabolites in medicinal crops. Secondary metabolites are synthesized through complex biochemical pathways that respond directly to environmental stressors. Optimizing these environmental parameters is essential for maximizing the yield of active pharmaceutical ingredients.

Solution:

- (a) Plants synthesize secondary metabolites, such as cardiac glycosides, as adaptive responses to environmental factors.
- (b) Factors like altitude, temperature, soil composition, and solar radiation profiles directly influence plant enzyme activities.
- (c) Growing medicinal crops at specific altitudes exposes them to unique solar radiation intensities that can stimulate metabolite synthesis.
- (d) Seasonal timing and time of day also alter secondary constituent levels due to natural diurnal fluctuations in plant metabolism.
- (e) Harvesting plants during periods of peak accumulation ensures high concentrations of active ingredients in the raw material.
- (f) These variations underscore the need to optimize environmental cultivation and seasonal collection conditions during commercial production.
- (g) Post-harvest preservation, adulteration matrices, and microscopic linear measurements are analytical tools that do not affect living plant biosynthetic yields.

Final Answer: Environmental cultivation and seasonal collection conditions

Answer: (B)

[Go Back to Question 88](#)



Q89.

Solution**Concept:**

Cardiovascular anatomy maps the specialized vessels and chambers that separate systemic circulation from pulmonary gas exchange loops. The right and left sides of the heart handle blood at different oxygenation stages. Directing deoxygenated blood to the respiratory capillary beds requires a unique vascular trunk that originates from the lower right chamber.

Solution:

- (a) The right ventricle receives oxygen-depleted blood from the systemic circulation via the right atrium and pumps it forward.
- (b) Upon contraction, the right ventricle ejects this deoxygenated blood directly into the prominent pulmonary artery trunk.
- (c) The pulmonary artery branches to carry deoxygenated blood into the lungs, where carbon dioxide is exchanged for oxygen.
- (d) This vessel is unique because it is the only major artery in the adult body that carries deoxygenated blood.
- (e) The systemic dorsal aorta distributes oxygenated blood from the left ventricle out to peripheral body tissues.
- (f) The superior vena cava returns deoxygenated blood to the right atrium, while pulmonary veins return oxygenated blood to the left atrium.

Final Answer: Pulmonary Artery**Answer: (B)**[Go Back to Question 89](#)

Q90.

Solution**Concept:**

Physical organic chemistry evaluates how structural modifications alter the electronic properties and acid-base equilibria of organic molecules. The acidity of a carboxylic acid depends on the stability of the carboxylate anion formed upon deprotonation. Introducing substituted functional groups near the reaction center can modify this stability through localized bond polarization.

Solution:

- (a) The relative strength of an organic acid is determined by how easily it releases a proton to form a stable conjugate base.
- (b) Introducing an electronegative chlorine atom at the alpha-position creates a highly polarized carbon-chlorine σ -bond.
- (c) This electronegative chlorine atom pulls electron density toward itself through the covalent bond chain via a permanent inductive effect.
- (d) This electron-withdrawing inductive effect ($-I$ effect) delocalizes the negative charge on the neighboring carboxylate group.
- (e) Delocalizing this negative charge stabilizes the conjugate base, shifting the equilibrium forward and significantly increasing the overall acid strength.
- (f) Electron-donating resonance structures increase electron density at the reaction center, which destabilizes the conjugate base and reduces acidity.
- (g) Steric inhibition of hyperconjugation and homolytic radical coupling represent separate structural phenomena that do not govern ground-state inductive properties.

Final Answer: Electron-withdrawing inductive effect ($-I$ effect)

Answer: (B)

[Go Back to Question 90](#)



Q91.

Solution**Concept:**

National healthcare initiatives implement structured monitoring programs to combat high-burden infectious diseases. Tuberculosis control requires long-term, multi-drug combinations to achieve complete eradication and minimize the emergence of drug-resistant bacterial strains. Ensuring patient adherence during this long treatment timeline requires specialized delivery systems that use direct community supervision.

Solution:

- (a) The primary strategy used under the national health program to fight tuberculosis is known as DOTS, or Directly Observed Treatment, Short-course.
- (b) This public health initiative ensures that patients ingest their scheduled multi-drug medication regimens under the direct visual observation of a trained healthcare worker.
- (c) Direct observation addresses the issue of poor patient adherence, which is a major driver of multi-drug resistant tuberculosis strains.
- (d) The baseline DOTS regimen combines potent bactericidal agents given over a standardized timeline divided into intensive and continuation phases.
- (e) Multi-drug therapy protocols are used in leprosy management, while pulse campaigns are typically deployed for widespread oral polio eradication programs.
- (f) Integrated vector surveillance focuses on monitoring insect breeding patterns to control illnesses like malaria rather than managing bacterial respiratory infections.

Final Answer: DOTS (Directly Observed Treatment, Short-course)

Answer: (B)

[Go Back to Question 91](#)



Q92.

Solution**Concept:**

Sterile product compounding relies on mechanical filtration barriers within specialized cleanroom environments to remove microscopic particulate matter. High-Efficiency Particulate Air filters are essential components of laminar airflow workbenches and cleanroom ceilings. These filters capture sub-micron particles through an interwoven matrix of fiberglass filaments that intercept contaminants moving in the air streams.

Solution:

- (a) A standard cleanroom environment relies on HEPA filters to maintain strict low-particle counts during aseptic compounding operations.
- (b) Standard industrial specifications require a standard HEPA filter to achieve a minimum particle collection efficiency of 99.97%.
- (c) This performance metric is evaluated using standard challenge aerosols containing fine particles measuring exactly 0.3 micrometers in diameter.
- (d) This specific particle dimension represents the most penetrating particle size, where mechanical interception and diffusion mechanisms are least effective.
- (e) Particles larger or smaller than 0.3 micrometers are captured with even higher efficiency due to inertial impaction and Brownian motion.
- (f) Lower efficiency ratings, such as 90% or 95% for larger particle sizes, are characteristic of coarse pre-filters rather than true HEPA filters.

Final Answer: 99.97% efficiency in removing airborne particles down to a size of 0.3 μm

Answer: (A)

[Go Back to Question 92](#)



Q93.

Solution**Concept:**

Clinical infectious disease management utilizes specialized polyene antimicrobials to treat life-threatening, deep-tissue systemic fungal infections. These amphipathic molecules target fungal cell walls by binding directly to membrane sterols, creating transmembrane pores that cause cell death. However, because these agents share some affinity for human cholesterol, they can cause significant toxicity in host tissues.

Solution:

- (a) Amphotericin B is a potent polyene antifungal antibiotic reserved for treating severe, progressive systemic mycoses.
- (b) The drug binds to ergosterol in fungal membranes, but its secondary affinity for cholesterol in renal tubular cells causes significant nephrotoxicity.
- (c) This toxic effect leads to renal vasoconstriction, structural damage to the tubules, and severe wasting of electrolytes like potassium and magnesium.
- (d) Consequently, clinicians must frequently monitor serum creatinine, blood urea nitrogen, and electrolyte levels during intravenous therapy.
- (e) Penicillin G is a beta-lactam antibacterial drug, whereas ciprofloxacin belongs to the fluoroquinolone class; neither agent has antifungal activity.
- (f) Griseofulvin is an oral antifungal drug used for superficial dermatophytic infections, rather than deep systemic mycoses, and does not cause severe renal toxicity.

Final Answer: Amphotericin B

Answer: (B)

[Go Back to Question 93](#)



Q94.

Solution**Concept:**

Quantitative volumetric titrations utilize organic dye indicators to visually identify the equivalence point of an acid-base neutralization reaction. These indicators are weak organic acids or bases that change color based on the ionization state of their structure. Selecting the right indicator requires matching its visual transition range with the pH shift that occurs at the titration equivalence point.

Solution:

- (a) Titrating a weak acid with a standardized strong base solution produces a basic equivalence point due to the hydrolysis of the resulting conjugate base.
- (b) Phenolphthalein is a weak organic acid indicator that changes color within a distinct alkaline pH range, between 8.2 and 10.0.
- (c) In its acidic form below pH 8.2, phenolphthalein remains completely lactoid and colorless in solution.
- (d) As the base drops near the equivalence point, the molecule loses protons, changing its structure into a pink quinoid configuration.
- (e) Methyl orange transitions within an acidic range, between 3.1 and 4.4, making it suitable for strong acid-weak base titrations.
- (f) Bromocresol green and thymol blue also transition at lower pH values, which do not align with the alkaline equivalence point of this weak acid titration.

Final Answer: Phenolphthalein

Answer: (B)

[Go Back to Question 94](#)



Q95.

Solution**Concept:**

Pharmacognosic authentication uses specific colorimetric assays to identify active alkaloids extracted from crude plant barks. Quinoline derivatives found in solanaceous or rubiaceaceous materials exhibit distinct optical behaviors when dissolved in dilute mineral acids. Exposing these solutions to specific halogens and alkaline reagents produces colorful coordination complexes that confirm the drug identity.

Solution:

- (a) Cinchona bark derived from *Cinchona calisaya* serves as the primary botanical source for the quinoline alkaloid quinine.
- (b) Dissolving the extracted alkaloid residue in dilute sulfuric acid produces a strong blue fluorescence under short-wavelength illumination.
- (c) Treating this solution with bromine water followed by ammonia triggers a specific reaction known as the Thalleioquin test.
- (d) The bromine oxidizes the quinine molecule, and adding ammonia transforms it into an emerald green copper-like thalleioquin complex.
- (e) This positive thalleioquin reaction confirms the presence of quinoline alkaloids, distinguishing them from other nitrogenous plant components.
- (f) Tropane alkaloids react positively to Vitali-Morin tests, while purines and isoquinolines like morphine require different acid-nitric reagent pairings.

Final Answer: Quinoline alkaloids, specifically quinine (Thalleioquin test positive)

Answer: (B)

[Go Back to Question 95](#)



Q96.

Solution**Concept:**

Gastrointestinal physiology maps structural adaptations along the digestive tract that optimize nutrient breakdown and absorption. Moving digested food from the stomach requires a highly specialized epithelial interface to absorb micronutrients into the bloodstream. This interface uses macroscopic and microscopic folds to increase the available contact surface area.

Solution:

- (a) The small intestine, which includes the duodenum, jejunum, and ileum, serves as the primary site for nutrient absorption.
- (b) To maximize absorption efficiency, its mucosal lining features large, finger-like projections called villi.
- (c) These villi expand the inner surface area of the intestinal wall, and their surfaces are covered in microvilli to form a brush border.
- (d) Each individual villus contains a capillary network and a specialized lymphatic vessel, or lacteal, to absorb and transport nutrients.
- (e) The esophagus features a stratified squamous lining designed to resist mechanical abrasion during swallowing rather than absorb nutrients.
- (f) The stomach fundus secretes mucus and acid, while the descending colon focuses on reabsorbing water and consolidating solid waste.

Final Answer: Small Intestine (Duodenum, Jejunum, and Ileum)

Answer: (C)

[Go Back to Question 96](#)



Q97.

Solution**Concept:**

Organic chemistry uses regioselective rules to predict the major products of electrophilic addition reactions across unsymmetrical alkenes. Adding a hydrogen halide across an asymmetric double bond can produce two different structural isomers. The distribution of these products depends on the stability of the carbocation intermediate formed during the initial step.

Solution:

- (a) Reacting propene with hydrogen bromide in the absence of peroxides proceeds via a classic electrophilic addition mechanism.
- (b) Markovnikov's rule states that the hydrogen atom adds to the alkene carbon that already holds more hydrogen substituents.
- (c) This addition pattern generates a more stable secondary carbocation intermediate rather than a less stable primary carbocation.
- (d) The remaining bromide nucleophile then attacks this secondary carbocation, yielding 2-bromopropane as the major product.
- (e) If peroxides were present, the reaction would follow a free-radical mechanism, resulting in an anti-Markovnikov addition to yield 1-bromopropane.
- (f) Hückel's rule defines the electron criteria needed for aromatic stabilization, while Hofmann criteria predict elimination patterns over addition orientations.

Final Answer: Markovnikov's Rule

Answer: (B)

[Go Back to Question 97](#)



Q98.

Solution**Concept:**

Immunology and public health utilize biological preparations to artificially stimulate host defenses against infectious pathogens. Active immunity requires exposing the host immune system to foreign antigens without causing the full severity of the disease. This exposure prompts B-lymphocytes to proliferate and differentiate into long-lived memory cell lines.

Solution:

- (a) Vaccines are specialized biological preparations that contain attenuated live, inactivated, or subunit fractions of target pathogens.
- (b) Administering a vaccine introduces these non-pathogenic antigens to host antigen-presenting cells, triggering an immune response.
- (c) The host immune system synthesizes specific antibodies and develops a pool of memory T and B cells against those antigens.
- (d) If the patient encounters the wild pathogen later, these memory cells drive a rapid, high-antibody response to neutralize the infection.
- (e) This process establishes long-lasting active immunity, in contrast to passive immunizations which provide temporary protection using pre-formed antibodies.
- (f) Prophylactic antivirals inhibit viral replication directly, while corticosteroids suppress immune responses rather than generating protective antibody memory.

Final Answer: Vaccines**Answer:** (C)[Go Back to Question 98](#)

Q99.

Solution**Concept:**

Hospital pharmacy operations implement financial and store control techniques to optimize working capital and maintain balanced material flows. Holding large volumes of pharmaceutical stock locks up significant capital and increases holding costs and expiration risks. Improving cash flow requires administrative strategies that accelerate inventory turnover rates.

Solution:

- (a) Materials management utilizes store and inventory control systems to track lead times, safety stocks, and turnover indices.
- (b) Accumulating excessive drug volumes creates high holding costs and ties up capital that could be used for other operational needs.
- (c) Reducing the turnaround time between ordering and using stock items increases the overall inventory turnover ratio.
- (d) This strategy minimizes capital investment in idle stock while ensuring essential medicines remain available.
- (e) Clinical diagnostic programming focuses on verifying patient laboratory data and treatment plans rather than managing inventory assets.
- (f) Forensic toxicology frameworks handle legal reporting for poisonings and controlled substances, rather than financial supply chains.

Final Answer: Store and inventory control management

Answer: (B)

[Go Back to Question 99](#)



Q100.

Solution**Concept:**

The Drugs and Cosmetics Act of 1940 establishes statutory definitions to regulate the quality, labeling, and distribution of pharmaceuticals in India. Products that pose health risks or deceive consumers are classified into distinct legal categories. Recognizing these statutory terms is essential for enforcement actions against substandard or fraudulent products.

Solution:

- (a) Under the statutory provisions of the Act, a drug is legally classified as a spurious drug if it mimics or is substituted for another drug entity.
- (b) This category applies when a product is labeled with the name of a different drug, or when its original active components are completely substituted.
- (c) Spurious drugs represent deliberate acts of substitution or imitation, often manufactured by unlicensed entities to deceive consumers.
- (d) Misbranded drugs involve labeling violations, such as misleading health claims, incorrect designs, or inadequate prescribing instructions.
- (e) Adulterated formulations contain filthy, putrid, or toxic decomposed elements that compromise the underlying purity of the compendial drug.
- (f) Intellectual patent drugs represent valid, legally protected therapeutic compounds rather than fraudulent or substituted products.

Final Answer: Spurious drug

Answer: (B)

[Go Back to Question 100](#)



Answer Key

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	B	2	C	3	C	4	B	5	B
6	C	7	B	8	B	9	B	10	C
11	B	12	B	13	B	14	B	15	B
16	B	17	B	18	C	19	B	20	C
21	B	22	B	23	B	24	B	25	B
26	B	27	B	28	C	29	C	30	B
31	C	32	B	33	B	34	A	35	B
36	B	37	B	38	B	39	B	40	C
41	B	42	B	43	B	44	B	45	A
46	A	47	B	48	A	49	B	50	B
51	B	52	C	53	B	54	B	55	A
56	B	57	C	58	C	59	C	60	B
61	B	62	B	63	A	64	C	65	B
66	B	67	B	68	B	69	B	70	B
71	A	72	B	73	B	74	B	75	B
76	B	77	B	78	B	79	B	80	B
81	A	82	B	83	C	84	B	85	B
86	A	87	A	88	B	89	B	90	B
91	B	92	A	93	B	94	B	95	B
96	C	97	B	98	C	99	B	100	B

