JELET Pharmacy Sample Paper-10

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. Which of the following mechanisms best explains the action of a non-competitive enzyme inhibitor?

(A) It binds reversibly to the active site, increasing K_m without altering V_{max}.

(B) It binds to an allosteric site, decreasing V_{max} while leaving K_m unchanged.

(C) It binds covalently to the active site, irreversibly decreasing V_{max}.

(D) It binds only to the enzyme-substrate complex, decreasing both K_m and V_{max}.

Q2. Under the Drugs and Cosmetics Act 1940, Schedule M specifies which of the following requirements?

(A) List of drugs exempted from provisions related to import

(B) Requirements for Good Manufacturing Practices (GMP) and factory premises

(C) Standards for cosmetics and toilet preparations

(D) Biological and special products requiring special manufacturing control

Q3. A sample of light kaolin is evaluated for particle size distribution. According to

the official requirements, which method is most legally accepted for the limit test of particle size of kaolin?

(A) Anderson pipette sedimentation method

(B) Sieve analysis using a 100-mesh screen

(C) Laser diffraction scattering technique

(D) Optical microscopy tracking projection area

Q4. In a hospital pharmacy, what type of inventory control classification prioritizes items based on their critical nature to patient survival rather than monetary values?

(A) ABC Analysis

(B) VED Analysis

(C) FSN Analysis

(D) HML Analysis

Q5. Calculate the volume of 95% v/v alcohol required to prepare 500 mL of 70% v/v alcohol.

(A) 368.42 mL

(B) 350.00 mL

(C) 268.42 mL

(D) 412.15 mL

Q6. What is the fundamental mechanism of action of Digitalis glycosides in the management of congestive heart failure?

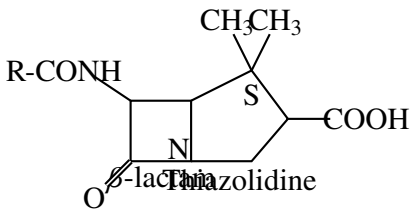
(A) Activation of Adenylate cyclase leading to high intracellular cAMP

(B) Blockade of Voltage-gated Calcium channels in myocardial cells

(C) Inhibition of membrane-bound Na^+/K^+-ATPase pump

(D) Stimulation of vascular Nitric oxide synthase

Q7. Which structural component is absolutely required for the antibacterial activity of Penicillins?



(A) Thiazolidine ring attached to a saturated γ-lactam ring

(B) A fused four-membered β-lactam ring and a five-membered thiazolidine ring

(C) A six-membered dihydrothiazine ring joined to a β-lactam loop

(D) Linear polyamide chain substituted with aromatic side-chains

Q8. Which specific cranial nerve is responsible for transmitting special sensory information regarding taste from the anterior two-thirds of the tongue?

(A) Glossopharyngeal nerve (CN IX)

(B) Vagus nerve (CN X)

(C) Facial nerve (CN VII)

(D) Trigeminal nerve (CN V)

Q9. In the chemical evaluation of *Digitalis purpurea* leaves, which specific color reaction confirms the presence of deoxy-sugars like digitoxose?

(A) Legal test showing an intense red color

(B) Keller-Kiliani test yielding a reddish-brown ring turning bluish-green

(C) Raymond's test establishing a violet-purple pigment

(D) Baljet's test indicating an orange-yellow precipitate

Q10. What is the standard concentration of sodium chloride required to make an aqueous solution isotonic with human blood plasma?

(A) 0.09% w/v

(B) 4.0% w/v

(C) 0.9% w/v

(D) 1.1% w/v

Q11. Which form is required under the Drugs and Cosmetics Rules for an application to manufacture Ayurvedic, Siddha, or Unani drugs for sale?

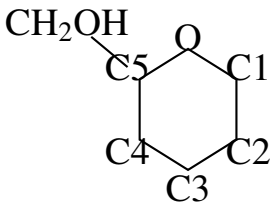
(A) Form 24-D

(B) Form 25-C

(C) Form 30

(D) Form 19-B

Q12. The structural transformation from an unbranched chain glucose to its cyclic glucopyranose form creates a new asymmetric center at which carbon position?



(A) C-5

(B) C-1

(C) C-2

(D) C-4

Q13. In the context of national health infrastructure, what is the target population size served by a single Primary Health Centre (PHC) in plain geographic areas?

(A) 5,000

(B) 10,000 to 15,000

(C) 30,000

(D) 1,20,000

Q14. An incompatibility arises when regular insulin is mixed directly in the same syringe with protamine zinc insulin. What class of incompatibility does this represent?

(A) Therapeutic incompatibility due to opposing physiological reactions

(B) Physical incompatibility via phase separation

(C) Chemical incompatibility leading to precipitation and altered release kinetics

(D) Intentional chemical modification to prolong duration

Q15. Under the provisions of the Pharmacy Act 1948, the minimum age requirement for a person to register their name as a registered pharmacist in a State Register is:

(A) 21 years

(B) 18 years

(C) 25 years

(D) 16 years

Q16. Which histological zone of the adrenal cortex is explicitly responsible for the biosynthesis and secretion of the mineralocorticoid aldosterone?

(A) Zona fasciculata

(B) Zona reticularis

(C) Zona glomerulosa

(D) Adrenal medulla proper

Q17. The mathematical model described by the Noyes-Whitney equation helps pharmacists directly quantify which of the following phenomena?

(A) Rate of drug degradation in liquid forms

(B) Rate of solute dissolution from solid matrices

(C) Particle sedimentation velocity in deflocculated suspensions

(D) Apparent volume of drug distribution in systemic plasma

Q18. Which structural element directly distinguishes a reducing sugar from a non-reducing sugar during testing with Benedict's reagent?

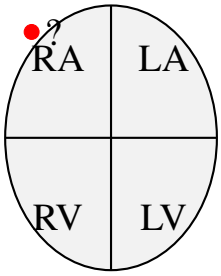
(A) Presence of an uncomplexed, free anomeric hydroxyl group

(B) Presence of a terminal primary allylic alcohol group

(C) Number of total equatorial hydroxyl links on the ring

(D) Presence of α-(1 $\rightarrow$ 4) glycosidic branch points

Q19. What specific anatomical structure functions as the primary pacemaker of the human heart due to its highest intrinsic rate of spontaneous depolarization?



(A) Atrioventricular Node (AV Node)

(B) Purkinje Fibers Network

(C) Sinoatrial Node (SA Node)

(D) Bundle of His

Q20. In public health epidemiological terms, when a infectious disease maintains a constant, baseline presence within a specific geographic area or population group without external inputs, it is termed:

(A) Epidemic

(B) Endemic

(C) Pandemic

(D) Sporadic

Q21. Which therapeutic agent acts as a competitive antagonist at muscarinic acetylcholine receptors, making it an effective choice to reverse organophosphate poisoning?

(A) Neostigmine

(B) Atropine

(C) Pilocarpine

(D) Pralidoxime

Q22. In the extraction of crude drugs, what term describes the process where a drug is macerated with continuous gentle heating below the boiling point of the solvent?

(A) Decoction

(B) Digestion

(C) Infusion

(D) Percolation

Q23. Which legal schedule under the Narcotic Drugs and Psychotropic Substances (NDPS) Rules governs the strict distribution and recording of psychotropic substances like Phenobarbital?

(A) Schedule X

(B) Schedule H

(C) Schedule G

(D) Schedule C

Q24. What is the fundamental mechanism of action of the aminoglycoside antibiotic Streptomycin?

(A) Competitive inhibition of dihydropteroate synthase

(B) Binding to the 30S ribosomal subunit, causing misreading of mRNA

(C) Inhibition of transpeptidase enzymes during cell wall assembly

(D) Stabilizing the DNA-topoisomerase II complex, preventing replication

Q25. Which specific diagnostic chemical test is used to confirm the presence of typhoid fever by detecting serum antibodies against *Salmonella typhi* antigens?

(A) Dick Test

(B) Widal Test

(C) Schick Test

(D) Mantoux Test

Q26. Which type of primary packaging material is highly recommended for storing light-sensitive formulations due to its ability to filter out damaging ultraviolet radiation?

(A) Type I Borosilicate clear glass

(B) Amber-colored Soda-lime glass

(C) High-density polyethylene translucent plastic

(D) Type III NP general-purpose soda-lime glass

Q27. How does a physiological buffer system maintain a relatively stable pH when a small amount of strong acid is introduced?

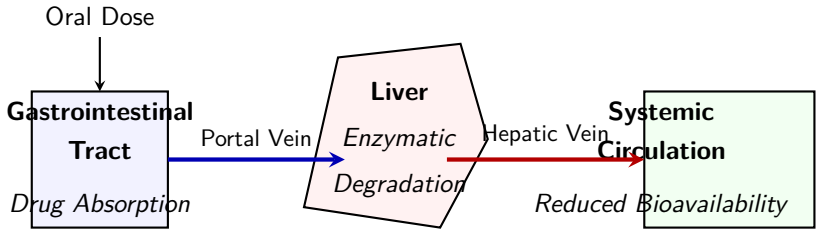
(A) The conjugate base reacts with excess hydronium ions to form a weak acid.

(B) The weak acid undergoes complete ionization to neutralize excess base.

(C) Hydroxyl ions are precipitated as insoluble salts.

(D) The salt dissociates completely to generate highly reactive free radicals.

Q28. What term describes the phenomenon where the systemic availability of an orally administered drug is significantly reduced by enzymatic degradation in the liver before it reaches the systemic circulation?



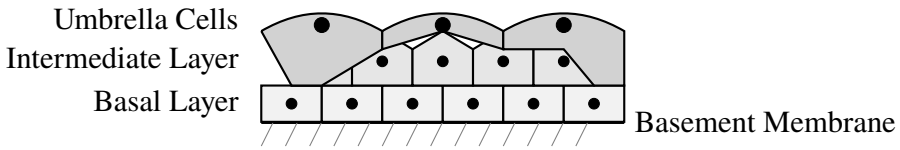
(A) Enterohepatic recycling

(B) Bioequivalence lag

(C) First-pass metabolism

(D) Passive carrier-mediated clearance

Q29. Which specialized epithelial tissue lines the inner mucosal wall of the urinary bladder and possesses the unique ability to stretch and flatten without tearing?



(A) Simple squamous epithelium

(B) Stratified squamous keratinized epithelium

(C) Pseudostratified ciliated columnar epithelium

(D) Transitional epithelium (Urothelium)

Q30. According to the Henderson-Hasselbalch equation, when the pH of a solution equals the pK_a of a weak acidic drug dissolved in it, what is the ratio of ionized to unionized drug forms?

(A) 1 : 10

(B) 1 : 1

(C) 10 : 1

(D) 100 : 1

Q31. Which chemical compound is standardly utilized as the reducing agent and color stabilizer in the official IP limit test for Iron?

(A) Citric acid

(B) Thioglycolic acid

(C) Ammonia solution

(D) Potassium thiocyanate

Q32. In hospital pharmacy management, a “floor stock system” refers to a method of drug distribution where:

(A) Medications are direct-delivered to the patient by the manufacturer.

(B) Non-charge health supplies and common drugs are stored directly in the nursing station.

(C) Every single dose is prepared and labeled individually within the central pharmacy.

(D) Patients purchase drugs directly from an outpatient commercial outlet.

Q33. Which functional component of a standard tablet formulation is specifically included to reduce inter-particulate friction and prevent the mass from adhering to the punch faces during compression?

(A) Glidant

(B) Binder

(C) Lubricant

(D) Disintegrant

Q34. Morphine produces its profound analgesic effect primarily by acting as an agonist at which specific G-protein coupled receptor type?

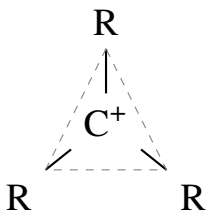
(A) α_1-Adrenergic receptor

(B) μ (Mu)-Opioid receptor

(C) 5-HT_3 Serotonin receptor

(D) D_2 Dopamine receptor

Q35. In organic chemistry mechanisms, a carbocation intermediate exhibits which specific type of spatial geometry and hybridization states around the positively charged carbon atom?



(A) Trigonal planar, sp^2

(B) Tetrahedral, sp^3

(C) Linear, sp

(D) Trigonal bipyramidal, sp^3d

Q36. What is the correct definition of "Posology" within pharmaceutical science?

(A) The systematic study of drug dynamic mechanisms inside tissues

(B) The science of determining appropriate doses of medicines for various patient conditions

(C) The specialized evaluation of physical and chemical drug incompatibilities

(D) The tracking and prevention of adverse drug reactions across a population

Q37. Which anatomical section of the human respiratory tract contains the vocal cords responsible for phonation?

(A) Pharynx

(B) Trachea

(C) Larynx

(D) Bronchus

Q38. In the structural analysis of volatile oils, which chemical building block consisting of five carbon atoms forms the fundamental basis of all terpenoid structures?

(A) Isoprene unit

(B) Phenanthrene unit

(C) Tropane ring

(D) Benzylisoquinoline skeleton

Q39. What type of physical instability occurs in an emulsion when the dispersed droplets coalesce and completely separate into a distinct macro-phase layer that cannot be redistributed by shaking?

(A) Creaming

(B) Flocculation

(C) Cracking (Phase inversion/Breaking)

(D) Phase conversion

Q40. Which parameters are systematically balanced in a formal hospital formulary system?

(A) Drug manufacturing speeds and shelf-life metrics

(B) Clinical efficacy, safety profile, and net financial cost of medications

(C) Patient satisfaction surveys and nursing shifts

(D) Legal classifications under Schedule H versus Schedule X

Q41. During the chemical evaluation of Ergot alkaloids, a brilliant blue color is developed when the crude extract is treated with which specific reagent?

(A) Van Urk's reagent

(B) Dragendorff's reagent

(C) Mayer's reagent

(D) Wagner's reagent

Q42. Which primary chemical process is the predominant pathway for the degradation of drugs containing ester or amide functional groups in liquid dosage forms?

(A) Photolysis

(B) Polymerization

(C) Hydrolysis

(D) Oxidative racemization

Q43. A patient is prescribed an over-the-counter (OTC) antacid along with oral Tetracycline. What is the clinical consequence of this simultaneous administration?

(A) The antacid increases renal excretion of tetracycline by changing urine pH.

(B) Divalent/trivalent cations in the antacid chelate tetracycline, preventing its gastrointestinal absorption.

(C) The antacid accelerates the hepatic metabolism of tetracycline via CYP induction.

(D) Tetracycline causes a systemic alkalosis by interacting with the antacid.

Q44. Which enzyme present in the human gastric juice plays a key role in initiating protein digestion by cleaving central peptide bonds in acidic environments?

(A) Trypsin

(B) Amylase

(C) Pepsin

(D) Lipase

Q45. In the chemical synthesis and structure-activity relationship (SAR) of Local Anesthetics, the presence of which specific structural linkage renders the molecule highly susceptible to rapid metabolic inactivation by plasma pseudocholinesterases?

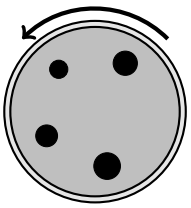
(A) Amide link

(B) Ester link

(C) Ether link

(D) Alkyl hydrocarbon chain

Q46. What is the fundamental operational mechanism of a Ball Mill used in pharmaceutical unit operations for size reduction?



(A) Compression and crushing between rollers

(B) High-velocity impact against static metal liners

(C) Combined impact and attrition between cascading spheres and particles

(D) Shearing action between high-speed blades

Q47. Under the family planning guidelines, what is the primary mechanism of action of copper-releasing intrauterine devices (IUDs) like Cu-T?

(A) Suppression of ovulation via negative feedback on the pituitary gland

(B) Thickening of cervical mucus to create a physical barrier for sperm

(C) Inducing a localized, sterile inflammatory response in the endometrium toxic to spermatozoa

(D) Destruction of the mature corpus luteum

Q48. Which plasma lipoprotein is commonly referred to as "good cholesterol" due to its ability to transport cholesterol away from peripheral vascular tissues back to the liver for excretion?

(A) Chylomicrons

(B) Low-Density Lipoprotein (LDL)

(C) High-Density Lipoprotein (HDL)

(D) Very-Low-Density Lipoprotein (VLDL)

Q49. Which microscopic feature is highly diagnostic for identifying the powdered leaf sample of *Atropa belladonna*?

(A) Presence of microsphenoidal (sandy) crystals of calcium oxalate in parenchymal cells

(B) Strongly lignified, long sclerenchymatous trichomes

(C) Anomocytic stomata with large cluster crystals of calcium carbonate

(D) Paracytic stomata with prominent uniseriate covering trichomes

Q50. A prescription contains the Latin term "t.i.d.". What instruction should the pharmacist write on the dispensing label for the patient?

(A) To be taken once a day

(B) To be taken three times a day

(C) To be taken every alternate hour

(D) To be taken immediately in case of emergency

Q51. Which primary organelle within a eukaryotic cell serves as the primary site for the post-translational modification, sorting, and packaging of proteins destined for secretion?

(A) Rough Endoplasmic Reticulum

(B) Golgi Apparatus

(C) Lysosome

(D) Peroxisome

Q52. The specific method used to cultivate *Cinchona succirubra* trees for the production of antimalarial quinoline alkaloids involves which propagation technique?

(A) Hydroponic nutrient media suspension

(B) Vegetative propagation via patch budding or cleft grafting

(C) Direct broad-scale mechanical seed broadcasting in arid soils

(D) Sub-surface rhizome cutting isolation

Q53. Which chemical compound is typically used as the primary chemical standard to calibrate and standardize the volumetric solution of Iodine in pharmaceutical assays?

(A) Sodium thiosulfate

(B) Arsenic trioxide

(C) Potassium permanganate

(D) Oxalic acid

Q54. What is the major therapeutic limitation or toxic effect associated with the long-term clinical use of the alkylating anticancer agent Cyclophosphamide?

(A) Ototoxicity and irreversible vestibular damage

(B) Pulmonary fibrosis and alveolar thickening

(C) Sterile hemorrhagic cystitis due to acrolein accumulation

(D) Peripheral sensory neuropathy and foot drop

Q55. In industrial tablet manufacturing, what is the primary cause of the defect known as “Capping”?

(A) Entrapment of air within the granules during compression, causing the top of the tablet to separate as a cap.

(B) Excess moisture content in the granulation mass making it sticky.

(C) Migration of colorants toward the tablet edges during high-temperature oven drying.

(D) Deep punch logo engraving cutting through the core structure.

Q56. Which hormone is directly synthesized by the supraoptic and paraventricular nuclei of the hypothalamus and stored/released from the posterior pituitary gland?

(A) Growth Hormone (GH)

(B) Adrenocorticotropic Hormone (ACTH)

(C) Antidiuretic Hormone (Vasopressin)

(D) Prolactin

Q57. In the legal context of the Drugs and Cosmetics Act, an article that is labeled or packed in imitation of another drug, or bears the name of another drug, is classified as a:

(A) Misbranded drug

(B) Spurious drug

(C) Adulterated drug

(D) Prohibited patent medicine

Q58. What is the absolute contraindicated route of administration for any oily or suspension-based dosage form due to the immediate risk of fatal pulmonary fat embolism?

(A) Intramuscular route

(B) Subcutaneous route

(C) Intravenous route

(D) Intradermal route

Q59. According to the structural classification of crude drugs, which group is classified explicitly as an "unorganized drug"?

(A) Digitalis leaves

(B) Acacia gum exudate

(C) Senna leaflets

(D) Clove flower buds

Q60. In community health practice, what is the major objective of the "Cold Chain" system?

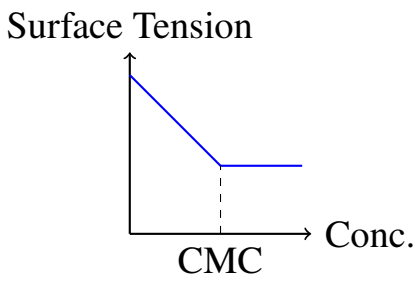
(A) Storing surgical instruments at sub-zero temperatures to achieve sterility

(B) Maintaining a continuous, low-temperature transport and storage environment for vaccines from manufacture to administration

(C) Freezing blood plasma to separate specific clotting factors

(D) Preserving corpse tissue samples during forensic toxicology testing

Q61. What physical property changes abruptly at the Critical Micelle Concentration (CMC) of a surfactant solution?



(A) The electrical conductivity drops while surface tension reaches a minimum plateau.

(B) The viscosity decreases linearly to zero.

(C) The solution completely separates into two distinct, macroscopic liquid phases.

(D) The boiling point drops below that of the pure solvent.

Q62. Which bone functions as the only movable component of the human skull, articulating directly with the temporal bone?

(A) Maxilla

(B) Mandible

(C) Zygomatic bone

(D) Sphenoid bone

Q63. What structural feature determines the classification of a compound as an "aromatic electrophilic substitution" substrate rather than a nucleophilic addition target?

(A) Presence of a highly polarized carbonyl carbon atom

(B) The high thermodynamic stability of a delocalized $(4n + 2)\pi$ electron ring system

(C) High degree of steric hindrance around peripheral sigma bonds

(D) Total length of the unbranched aliphatic chain side-link

Q64. In clinical pathology, what does an abnormally elevated level of serum alanine aminotransferase (ALT) and aspartate aminotransferase (AST) indicate?

(A) Acute myocardial infarction exclusively

(B) Renal tubular necrosis and failure of glomerular filtration

(C) Hepatocellular damage or active liver injury

(D) Skeletal muscle dystrophy due to nutritional deficiencies

Q65. Which chemical class does the active constituent "Sennoside A", extracted from *Cassia angustifolia*, belong to?

(A) Tropane alkaloid

(B) Anthraquinone glycoside

(C) Cardenolide steroid

(D) Monoterpene lactone

Q66. The core principle of "Patient Counselling" by a community pharmacist during prescription dispensing involves which action?

(A) Modifying the dose of a prescription drug without consulting the prescriber

(B) Verbally reviewing the correct usage, potential side effects, storage, and dietary restrictions with the patient

(C) Recommending alternative prescription brands based strictly on profit margins

(D) Diagnosing the underlying clinical pathology based on physical symptoms

Q67. What is the primary mechanism of action of the loop diuretic Furosemide in the renal nephron?

(A) Competitive antagonism of aldosterone at the distal tubule

(B) Selective inhibition of the $Na^+/K^+/2Cl^-$ cotransporter in the thick ascending limb of the loop of Henle

(C) Inhibition of carbonic anhydrase in the proximal convoluted tubule

(D) Blockade of the Na^+/Cl^- symporter in the early distal tubule

Q68. Which parameter is evaluated by calculating the "Hausner ratio" or "Carr's index" of a bulk pharmaceutical powder?

(A) Chemical stability over six months

(B) Flow properties and compressibility characteristics

(C) Absolute surface area available for dissolution

(D) True density using a helium pycnometer

Q69. In a formal prescription format, the section that contains specific directions to the pharmacist regarding the type and preparation of the dosage form is known as the:

(A) Superscription

(B) Inscription

(C) Subscription

(D) Signatura

Q70. Which element is specified as a critical component in the chemical structures of hormones secreted by the thyroid gland, such as Thyroxine (T_4)?

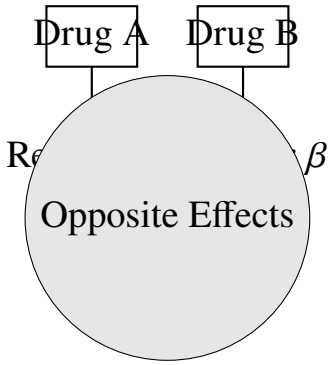
(A) Iron

(B) Iodine

(C) Zinc

(D) Selenium

Q71. What type of functional antagonism occurs when two therapeutic agents act on entirely different sets of receptors but produce completely opposite physiological effects on the same tissue?



(A) Chemical antagonism

(B) Competitive pharmacological antagonism

(C) Physiological (Functional) antagonism

(D) Non-competitive allosteric antagonism

Q72. In the official limit test for Arsenic, what is the chemical function of adding Lead Acetate cotton wool in the mouth of the Gutzeit apparatus?

(A) To trap any hydrogen gas evolved during the reaction

(B) To filter out moisture from entering the mercuric chloride paper zone

(C) To trap hydrogen sulfide gas impurities which would otherwise stain the test paper

(D) To act as a secondary catalyst to speed up arsine gas generation

Q73. What is the major product formed when primary alcohols undergo controlled, mild oxidation in the presence of pyridinium chlorochromate (PCC)?

(A) Carboxylic acid

(B) Ketone

(C) Aldehyde

(D) Ester

Q74. Which system or organ is the primary target of toxicity when a patient experiences acute poisoning from the heavy metal Lead (Plumbism)?

(A) Central Nervous System and Hematopoietic system

(B) Cardiac conduction myofibrils exclusively

(C) Respiratory alveolar membranes

(D) Dermal keratinocytes

Q75. Which component of the human blood is anucleated at maturity and packed with hemoglobin to optimize the transport of respiratory gases?

(A) Neutrophil

(B) Erythrocyte (Red Blood Cell)

(C) Lymphocyte

(D) Thrombocyte

Q76. Which type of material handling system or device is most suitable for continuously conveying dry, highly cohesive granulated materials vertically up to a tablet hopper?

(A) Belt conveyor

(B) Pneumatic conveyor or Bucket elevator

(C) Scraper conveyor

(D) Gravity-feed roller bed

Q77. When a crude drug sample consists of a genuine species substituted with a completely exhausted drug material from which the active constituents have been removed, this practice is termed:

(A) Sophistication

(B) Substitution with sub-standard commercial variants

(C) Adulteration by exhaustion

(D) Spoilage due to microbial attack

Q78. In biochemistry, the pathway of anaerobic glycolysis occurs entirely within which specific compartment of a human skeletal muscle cell?

(A) Mitochondrial matrix

(B) Inner mitochondrial membrane

(C) Cytosol

(D) Nucleoplasm

Q79. Under the National Health Mission guidelines, the primary objective of the Revised National Tuberculosis Control Programme (RNTCP), now known as NTEP, is to deliver which standardized therapy?

(A) HAART therapy

(B) DOTS (Directly Observed Treatment, Short-course)

(C) MDT (Multi-Drug Therapy) for leprosy

(D) Pulse polio immunization regimens

Q80. What is the primary role of a humectant when formulated into topical semi-solid dosage forms like creams or gels?

(A) To act as an oil-in-water emulsifying agent

(B) To prevent the loss of moisture from the preparation and keep the skin hydrated

(C) To serve as a broad-spectrum antimicrobial preservative

(D) To adjust the final structural viscosity of the hydrocarbon base

Q81. Which structure-activity relationship feature is vital for the intense anti-inflammatory profile of Glucocorticoids?

(A) Absence of a keto group at the C-3 position

(B) Presence of a Δ^4-3-keto group in the A ring and an 11β-hydroxyl group

(C) Elimination of the side chain at the C-17 position

(D) Presence of an aromatic configuration across rings A, B, and C

Q82. Which lymphoid organ is structurally responsible for filtering foreign antigens from blood and breaking down aged, worn-out erythrocytes?

(A) Thymus gland

(B) Lymph node

(C) Spleen

(D) Tonsils

Q83. What is the fundamental requirement for a chemical reaction to follow pseudo-first-order kinetics during a stability testing study?

(A) The reaction must involve two reactants where one is present in a large excess, making its concentration virtually constant.

(B) The reaction rate must be completely independent of all reactant concentrations.

(C) The reaction must take place in an anhydrous organic solvent medium.

(D) The activation energy barrier must be reduced to zero using an inorganic catalyst.

Q84. Which specific test parameter evaluates the mechanical strength of tablets by measuring their resistance to capping, abrasion, or splintering during tumbling handling?

(A) Weight variation test

(B) Content uniformity test

(C) Friability test using a Roche friabilator

(D) Disintegration time test

Q85. In the classification of tannins, which reagent is used to selectively distinguish hydrolyzable tannins from condensed tannins by giving a blue-black coloration?

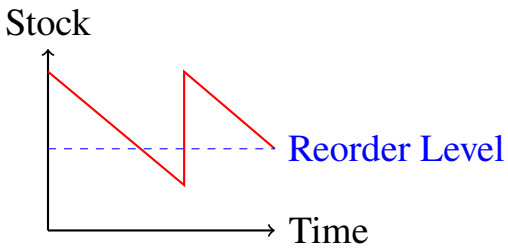
(A) Ferric chloride solution

(B) Gelatin solution

(C) Matchstick test (Phenazone test)

(D) Bromine water test

Q86. What is the primary operational objective of establishing an optimal "Reorder Level" in a hospital pharmacy's inventory management protocol?



(A) To completely eliminate the physical space required for warehousing

(B) To trigger a new purchase order before the existing safety stock is completely exhausted, preventing stockouts

(C) To minimize the taxes paid on commercial goods

(D) To enforce a strict first-in, first-out stock distribution rule

Q87. Which chemical test is standardly utilized in clinical pathology to detect the abnormal presence of bile salts in a patient's urine sample?

(A) Benedict's test

(B) Hay's sulfur test

(C) Rothera's nitroprusside test

(D) Fouchet's test

Q88. Which functional division of the human nervous system prepares the body for high-energy "fight-or-flight" emergency situations by increasing heart rate and dilating airways?

(A) Parasympathetic nervous system

(B) Sympathetic nervous system

(C) Somatic motor nervous system

(D) Enteric nervous system

Q89. In organic chemistry, according to Markovnikov's rule, what is the major product when an unsymmetrical alkene reacts with a hydrogen halide like HBr?

(A) The halide ion adds preferentially to the carbon with the greater number of hydrogen atoms.

(B) The hydrogen atom attaches to the carbon atom that has the greater number of hydrogen atoms.

(C) An equal 50:50 racemic mixture of both structural isomers is obtained.

(D) The reaction proceeds via a free radical mechanism yielding an anti-Markovnikov product.

Q90. What clinical term describes a severe, life-threatening type I hypersensitivity reaction characterized by systemic vasodilation, profound hypotension, and bronchoconstriction following drug exposure?

(A) Idiosyncrasy

(B) Anaphylactic shock

(C) Tachyphylaxis

(D) Teratogenicity

Q91. What is the primary role of the Pharmacy Council of India (PCI) as established under the Pharmacy Act 1948?

(A) To fix the retail price of essential life-saving formulations across the nation

(B) To regulate the educational standards and approve courses of study for registration as a pharmacist

(C) To issue manufacturing licenses directly to pharmaceutical factories

(D) To conduct clinical trials for novel chemical entities

Q92. Which anatomical structure separates the human thoracic cavity from the abdominal cavity and acts as the principal muscle of quiet inspiration?

(A) Intercostal muscle matrix

(B) Diaphragm

(C) Linea alba

(D) Pleural membrane

Q93. The extraction technique known as "Percolation" involves which basic procedural step?

(A) Boiling the crude drug continuously with water for a specified period

(B) Allowing the comminuted drug to stand with solvent before a continuous downward displacement of the extractant through a column of the drug

(C) Exposing the drug mass to high-pressure steam inside an enclosed chamber

(D) Expressing the liquid extract under a mechanical hydraulic press

Q94. Which hormone is secreted by the endocrine portion of the pancreas (islets of Langerhans) to stimulate glycogenolysis and gluconeogenesis, thereby elevating blood glucose levels?

(A) Insulin

(B) Glucagon

(C) Somatostatin

(D) Pancreatic polypeptide

Q95. In quantitative analysis, a buffer solution composed of a mixture of ammonium chloride and ammonium hydroxide is standardly categorized as what type of buffer system?

(A) Acidic buffer with a stable pH range below 7.0

(B) Basic buffer with a stable pH range above 7.0

(C) Neutral amphoteric self-adjusting matrix

(D) Volatile gas-evolving buffer system

Q96. What type of drug-induced toxic effect refers specifically to the capacity of a substance to cause structural or functional developmental abnormalities in a fetus when taken during pregnancy?

(A) Carcinogenicity

(B) Mutagenicity

(C) Teratogenicity

(D) Tolerance induction

Q97. Which analytical evaluation parameter measures the optical rotation of a liquid crude drug or volatile oil using a polarimeter to verify its purity?

(A) Refractive index

(B) Specific optical rotation

(C) Iodine value

(D) Saponification value

Q98. In the hospital unit dose dispensing system, a “decentralized unit dose system” differs from a centralized system because:

(A) All medications are packaged individually by the retail manufacturer.

(B) Satellite pharmacies located on specific nursing floors dispense the individual unit doses.

(C) Patients collect their doses directly from a primary warehouse box.

(D) The system relies entirely on automatic mechanical vending machines without human supervision.

Q99. Which specific structures within the female reproductive system serve as the standard site where fertilization of the mature ovum by a spermatozoon occurs?

(A) Endometrial wall of the uterus

(B) Fallopian tubes (Oviducts, specifically the ampulla)

(C) Cervical canal

(D) Ovarian follicles

Q100. What is the legal requirement for a retail pharmacy regarding the storage and dispensing records of Schedule H drugs?

(A) They must be stored in a separate locked cabinet and can only be sold to patients with a valid prescription, with details recorded in a prescription register.

(B) They can be sold over the counter without any prescription restrictions.

(C) They must be sampled by a Government Analyst prior to every retail transaction.

(D) Their records must be forwarded to the Central Narcotics Bureau every 24 hours.

Detailed Solutions

Q1.

Solution

Concept:

Enzyme inhibition studies focus on how inhibitor molecules alter substrate binding and reaction velocities. A non-competitive inhibitor binds reversibly to an allosteric site (a site distinct from the active catalytic domain) on both the free enzyme (E) and the enzyme-substrate complex (ES). Because it does not compete with the substrate for the active pocket, increasing substrate concentration cannot displace the inhibitor.

Solution:

Step 1: Understand the binding kinetics of non-competitive inhibitors. The inhibitor binds with equal affinity to E and ES, forming inactive EI and ESI complexes.

Step 2: Analyze the effect on the maximum velocity (V_{max}). Since the ESI complex cannot proceed to form the final product, the effective concentration of functional enzyme decreases. This irreversibly lowers the maximum possible rate of the reaction, resulting in a reduction of V_{max}.

Step 3: Analyze the effect on the Michaelis constant (K_m). K_m represents the substrate concentration at which the reaction velocity is half of V_{max}, reflecting the apparent affinity between the enzyme and substrate. Because the inhibitor binds to an entirely separate allosteric site, it does not interfere with the initial binding of the substrate to the active catalytic domain.

Step 4: Conclude that the operational affinity remains unaltered, which mathematically translates to K_m remaining entirely constant or unchanged. Therefore, a non-competitive inhibitor characteristically lowers V_{max} while leaving the K_m value unaltered.

Final Answer: It binds to an allosteric site, decreasing V_{max} while leaving K_m unchanged.

Answer: (B)

Go Back to Question 1

Q2.

Solution

Concept:

The Drugs and Cosmetics Act of 1940 and its subsequent Rules of 1945 organize specific legislative guidelines, administrative standards, and technical protocols into comprehensive statutory lists known as Schedules. These alphabetical schedules dictate standards for manufacturing, labeling, biological testing, and clinical trial regulations for all pharmaceutical products sold within the country.

Solution:

Step 1: Define the statutory role of Schedule M under the central Drugs and Cosmetics Rules. Schedule M explicitly outlines the comprehensive regulatory requirements for factory premises, hygiene conditions, waste disposal, water systems, and infrastructure design.

Step 2: Connect Schedule M to the global concept of Good Manufacturing Practices (GMP). It acts as the legal backbone ensuring that every pharmaceutical manufacturing facility operates under rigid quality control systems to minimize contamination and cross-contamination hazards during industrial operations.

Step 3: Eliminate incorrect options by evaluating alternative schedules. Schedule Y dictates clinical trials, Schedule P specifies life periods and expiry conditions of medications, and Schedule O outlines specifications for disinfectant fluids. Therefore, Schedule M is strictly dedicated to setting the legal minimum benchmark for factory infrastructures and modern GMP guidelines.

Final Answer: Requirements for Good Manufacturing Practices (GMP) and factory premises

Answer: (B)

Go Back to Question 2

Q3.

Solution

Concept:

The physical properties of mineral-based crude excipients, such as kaolin, directly alter their adsorption capabilities and formulation safety. Official pharmacopeias dictate stringent limit tests to check particle size distribution, preventing the inclusion of coarse particles that could compromise smooth topical or internal formulations.

Solution:

Step 1: Identify the underlying physical principles of kaolin particle size evaluation. Particle size distribution of fine pharmaceutical powders is standardly monitored through gravitational settling rates in a liquid medium.

Step 2: Apply Stokes' law of sedimentation, which relates the settling velocity of a sphere to its diameter, density, and liquid viscosity. The official pharmacopeial standard relies on tracking this sedimentation behavior over fixed time frames.

Step 3: Identify the specific apparatus chosen for the official limit test of light kaolin. The Anderson pipette sedimentation method is designated as the primary compendial standard for measuring the mass percentage of particles falling below specified micron thresholds. This makes it the only legally recognized limit test for evaluating particle size uniformity in kaolin.

Final Answer: Anderson pipette sedimentation method

Answer: (A)

Go Back to Question 3

Q4.

Solution

Concept:

Hospital pharmacy inventory control uses specialized operational frameworks to classify medicinal products. While some methods evaluate total annual financial consumption, other management tools categorize pharmaceuticals based on their critical nature, absolute indispensability, and clinical urgency during patient care operations.

Solution:

Step 1: Define the acronym VED in materials management. VED stands directly for Vital, Essential, and Desirable classifications.

Step 2: Analyze the operational priorities of each sub-category. "Vital" items are life-saving drugs that must be available in stock continuously, as their absence can cause immediate clinical mortality. "Essential" items are critical drugs whose absence can be tolerated for a short duration, while "Desirable" items represent optional or easily substitutable formulations.

Step 3: Contrast VED analysis with other inventory options. ABC analysis prioritizes inventory strictly on monetary consumption values (70%, 20%, 10%), whereas FSN tracks the velocity of stock movement (Fast, Slow, Non-moving). Because the prompt focuses entirely on patient survival and clinical criticality rather than financial calculations, VED analysis is the correct operational tool.

Final Answer: VED Analysis

Answer: (B)

Go Back to Question 4

Q5.

Solution

Concept:

Pharmaceutical dilution calculations rely on the principle of conservation of mass, meaning the absolute amount of pure solute remains constant before and after adding a diluent. The relationship between the initial concentration and volume and the final concentration and volume is modeled by the standard dilution equation:

$$C_1V_1 = C_2V_2$$

Solution:

Step 1: Extract the known numerical values given in the problem statement. The initial concentration (C_1) of the stock alcohol is 95% v/v. The desired final concentration (C_2) is 70% v/v, and the desired final volume (V_2) is 500 mL.

Step 2: Set up the algebraic equation to solve for the unknown initial stock volume (V_1):

$$95 \times V_1 = 70 \times 500$$

Step 3: Isolate V_1 by dividing both sides of the equation by 95:

$$V_1 = \frac{70 \times 500}{95}$$

Step 4: Perform the final arithmetic calculations:

$$V_1 = \frac{35000}{95} = 368.42105 \text{ mL}$$

Rounding to two decimal places yields exactly 368.42 mL. This represents the volume of stock alcohol needed, with the remaining balance up to 500 mL made up of purified water.

Final Answer: 368.42 mL

Answer: (A)

Go Back to Question 5

Q6.

Solution

Concept:

Cardiac glycosides, such as digitoxin and digoxin, are naturally occurring cardiotonic compounds that exert a positive inotropic effect on failing myocardial tissue. Their primary pharmacological mechanism targets ion transport across the sarcolemma, altering intracellular ion gradients to enhance cardiac contractility.

Solution:

Step 1: Pinpoint the specific molecular target of Digitalis. It binds to and inhibits the extracellular domain of the membrane-bound Na^+/K^+-ATPase pump.

Step 2: Trace the downstream ionic consequences of this enzyme inhibition. Blocking this pump reduces the active extrusion of sodium ions, causing an accumulation of intracellular Na^+.

Step 3: Analyze the effect on secondary transport systems. The elevated intracellular Na^+ gradient slows down the Na^+/Ca^{2+} exchanger (NCX), reducing the efflux of calcium ions out of the cell.

Step 4: Link increased calcium storage to enhanced contractility. The resulting pool of intracellular Ca^{2+} is pumped into the sarcoplasmic reticulum, making more calcium available during subsequent depolarizations. This amplifies actin-myosin cross-bridge formation and increases myocardial contractility.

Final Answer: Inhibition of membrane-bound Na^+/K^+-ATPase pump

Answer: (C)

Go Back to Question 6

Q7.

Solution

Concept:

The structure-activity relationship (SAR) of beta-lactam antibiotics dictates their affinity for penicillin-binding proteins (PBPs), which regulate bacterial cell wall cross-linking. Modifying the bicyclic core structure or breaking its internal cyclic amide bonds completely inactivates its antimicrobial properties.

Solution:

Step 1: Analyze the core chemical structure of the penicillin nucleus, known as 6-aminopenicillanic acid (6-APA).

Step 2: Identify the two fused rings that form this core framework. The first is a highly strained, four-membered cyclic amide ring known as the β-lactam ring. The second is a sulfur-containing, saturated five-membered ring containing a carboxylic acid group, known as the thiazolidine ring.

Step 3: Evaluate how this structural configuration drives antibacterial activity. The high ring strain within the four-membered β-lactam ring allows it to mimic the D-Ala-D-Ala terminus of bacterial peptidoglycan chains, covalently acylating the transpeptidase enzyme.

Step 4: Conclude that a fused four-membered β-lactam ring joined directly to a five-membered thiazolidine ring is the essential structural requirement for penicillin activity.

Final Answer: A fused four-membered β-lactam ring and a five-membered thiazolidine ring

Answer: (B)

Go Back to Question 7

Q8.

Solution

Concept:

The tongue receives complex, overlapping sensory innervation divided by its anatomical regions and functional modalities (general somatic sensation versus specialized gustatory taste sensation). Specific pairs of cranial nerves are responsible for monitoring distinct regions of the lingual mucosa.

Solution:

Step 1: Divide the tongue into its primary anatomical sections for taste mapping. The tongue is divided into the anterior two-thirds and the posterior one-third.

Step 2: Identify the nerve responsible for gustatory sensation in the posterior one-third. The glossopharyngeal nerve (CN IX) provides both general sensation and specialized taste to this rear region.

Step 3: Analyze the innervation of the anterior two-thirds of the tongue. While the lingual nerve (a branch of CN V) carries general somatic sensations like touch and temperature, specialized taste signals are captured by the chorda tympani fibers.

Step 4: Track the origin of the chorda tympani. The chorda tympani is a specialized branch of the facial nerve (CN VII). Therefore, the facial nerve is explicitly responsible for transmitting taste information from the anterior two-thirds of the tongue.

Final Answer: Facial nerve (CN VII)

Answer: (C)

Go Back to Question 8

Q9.

Solution

Concept:

Phyto-chemical evaluation techniques use distinct color reactions to identify specific chemical groups within cardiotonic glycoside molecules. These formulations contain an aglycone core linked to specific deoxysugar moieties, which can be distinguished under strongly acidic analytical conditions.

Solution:

Step 1: Identify the chemical components of digitalis glycosides. They consist of a steroidal aglycone unit attached to unique 2,6-deoxysugars, such as digitoxose.

Step 2: Evaluate the specificity of the Keller-Kiliani test. This test involves dissolving the extract in glacial acetic acid containing a trace amount of ferric chloride, followed by the careful addition of concentrated sulfuric acid to form a lower layer.

Step 3: Describe the visual endpoint of a positive test. A reddish-brown ring forms at the liquid interface, while the upper acetic acid layer gradually develops a characteristic bluish-green color. This specific color change confirms the presence of digitoxose sugars.

Step 4: Differentiate this from other options. Legal, Raymond's, and Baljet's tests use alkaline reagents to interact with the unsaturated lactone ring of the cardenolide aglycone rather than testing for sugar components.

Final Answer: Keller-Kiliani test yielding a reddish-brown ring turning bluish-green

Answer: (B)

Go Back to Question 9

Q10.

Solution

Concept:

Isotonicity is a critical physicochemical parameter for parenteral, ophthalmic, and intravenous formulations. An isotonic solution exerts an identical osmotic pressure across a semipermeable membrane as biological fluids, preventing fluid shifts that can cause cellular hemolysis or crenation.

Solution:

Step 1: Define osmotic pressure in relation to human blood plasma. Human blood plasma has an osmolality of approximately 290 mOsm/L, creating an osmotic pressure equivalent to a specific freezing point depression ($\Delta T_f = -0.52^\circ$C).

Step 2: Determine the required concentration of a standard electrolyte solution to match this freezing point depression. An aqueous solution of sodium chloride (NaCl) must match this precise osmotic threshold to be considered truly isotonic.

Step 3: Identify the exact percentage strength required. Experimental data and compendial standards establish that a 0.9% w/v sodium chloride solution matches the osmotic profile of blood plasma and tears. This formulation is commonly referred to as normal saline.

Final Answer: 0.9% w/v

Answer: (C)

Go Back to Question 10

Q11.

Solution

Concept:

The administrative framework of the Drugs and Cosmetics Act includes a structured system of numbered forms for managing licensing applications. Individual forms are designated for applications, renewals, and the formal granting of licenses across various classes of therapeutic agents.

Solution:

Step 1: Identify the specific category of drugs mentioned in the prompt. The question asks about manufacturing applications for traditional Indian systems of medicine, which include Ayurvedic, Siddha, and Unani (ASU) drugs.

Step 2: Locate the legal forms associated with ASU drug manufacturing. Under the Drugs and Cosmetics Rules, Form 24-D is designated as the official application form for a license to manufacture these traditional formulations for sale or commercial distribution.

Step 3: Differentiate this from the other options. Form 25-C is used for manufacturing licenses for homeopathic medicines, while Form 19-B applies to licenses for retail sales. Therefore, Form 24-D is the correct document for ASU manufacturing applications.

Final Answer: Form 24-D

Answer: (A)

Go Back to Question 11

Q12.

Solution

Concept:

Mutarotation and carbohydrates cyclization chemistry involves an intramolecular nucleophilic attack within an open-chain aldohexose structure. This structural rearrangement converts an achiral carbonyl carbon into a new chiral center, generating distinct alpha and beta anomeric configurations.

Solution:

Step 1: Examine the open-chain structure of D-glucose. It contains an aldehyde group at the terminal C-1 position and hydroxyl groups on the remaining carbon backbone (C-2 through C-6).
Step 2: Trace the cyclization mechanism. The hydroxyl group located on the C-5 carbon performs an intramolecular nucleophilic addition on the sp^2-hybridized carbonyl carbon at the C-1 position.
Step 3: Identify the resulting structural changes. This ring closure forms a stable, six-membered cyclic hemiacetal ring known as glucopyranose.
Step 4: Locate the newly created asymmetric center. The primary reaction transforms the C-1 carbonyl carbon from an achiral state into a new asymmetric, tetrahedral chiral center. This specific carbon is termed the anomeric carbon, making C-1 the correct position.

Final Answer: C-1

Answer: (B)

Go Back to Question 12

Q13.

Solution

Concept:

The national healthcare delivery architecture in India uses a tiered framework to provide rural health coverage. Primary Health Centres (PHCs) serve as essential institutional links between frontline sub-centres and secondary Community Health Centres (CHCs), with infrastructure allocations calculated based on local population densities.

Solution:

Step 1: Review the population criteria established by the Bhore Committee and current health planning frameworks for setting up a PHC.
Step 2: Distinguish between different geographic terrains. For difficult, hilly, tribal, or backward desert regions, a single PHC is mandated to cover a population of 20, 000 individuals.
Step 3: Determine the population threshold for standard non-hilly terrains. In plain geographic regions, a Primary Health Centre is designed to serve a benchmark population of 30, 000 individuals. This ensures proper coverage before cases are escalated to larger district hospitals.

Final Answer: 30,000

Answer: (C)

Go Back to Question 13

Q14.

Solution

Concept:

Formulation incompatibilities occur when combining two or more therapeutic entities leads to physical, chemical, or therapeutic changes that alter safety, uniform dosing, or clinical efficacy. Chemical incompatibilities often involve structural neutralization, precipitation, or complexation reactions.

Solution:

Step 1: Analyze the properties of the two components. Regular insulin is a clear, soluble, short-acting insulin formulation. Protamine zinc insulin (PZI) is a long-acting suspension containing excess basic protamine and zinc ions designed to prolong release.

Step 2: Identify the chemical reaction that occurs upon mixing. When mixed directly in the same syringe, the excess protamine in the PZI formulation binds with the soluble regular insulin molecules.

Step 3: Determine the physical consequence of this interaction. This binding precipitates the soluble insulin, converting a portion of the rapid-acting regular insulin into a long-acting complex. This alteration of the dissolution profile represents a classic chemical incompatibility.

Final Answer: Chemical incompatibility leading to precipitation and altered release kinetics

Answer: (C)

Go Back to Question 14

Q15.

Solution

Concept:

The Pharmacy Act of 1948 established a statutory framework to regulate the profession of pharmacy across India. It defines the minimum educational qualifications, practical training requirements, and age standards necessary for entry into the official State Registers managed by State Pharmacy Councils.

Solution:

Step 1: Review the statutory provisions of Chapter IV of the Pharmacy Act of 1948, which governs the registration of pharmacists.

Step 2: Identify the explicit qualifications required for an individual's first registration. The applicant must have paid the prescribed fees, hold an approved diploma or degree in pharmacy (such as a D.Pharm or B.Pharm), and fulfill the minimum age requirement.

Step 3: Determine the legal age threshold. The Act states that an applicant must have attained the age of 18 years to be legally registered as a professional pharmacist in a State Register.

Final Answer: 18 years

Answer: (B)

Go Back to Question 15

Q16.

Solution

Concept:

The adrenal cortex is divided into three distinct histological zones, each containing specialized endocrine cells equipped with specific enzyme pathways to synthesize distinct classes of steroid hormones from a cholesterol precursor.

Solution:

Step 1: List the outer-to-inner histological zones of the adrenal cortex. These are the Zona glomerulosa, the Zona fasciculata, and the Zona reticularis.

Step 2: Identify the primary secretions of each zone. The inner Zona reticularis synthesizes sex androgens, while the thick middle Zona fasciculata produces glucocorticoids like cortisol.

Step 3: Analyze the outermost layer. The thin, superficial Zona glomerulosa contains the enzyme aldosterone synthase, which is essential for producing mineralocorticoids. Therefore, this zone is responsible for synthesizing and secreting aldosterone to regulate systemic electrolyte balance.

Final Answer: Zona glomerulosa

Answer: (C)

Go Back to Question 16

Q17.

Solution

Concept:

Solid dosage form pharmacokinetics and biopharmaceutics model how physical parameters govern mass transfer rates from a solid crystal matrix into a surrounding liquid dissolution medium. This relationship is mathematically quantified by the Noyes-Whitney equation:

$$\frac{\mathrm{d}C}{\mathrm{d}t} = \frac{DA}{h}(C_s - C_b)$$

Solution:

Step 1: Break down the mathematical terms within the equation. $\frac{\mathrm{d}C}{\mathrm{d}t}$ represents the dissolution rate, D is the diffusion coefficient, A is the effective surface area, h is the diffusion layer thickness, C_s is the saturation solubility, and C_b is the concentration in the bulk medium.

Step 2: Correlate this mathematical model with a physical phenomenon. The equation relates particle surface area and concentration gradients directly to the rate of mass transfer into solution.

Step 3: Identify the correct option. This formula models the rate of solute dissolution from solid matrices, providing a foundational tool for designing immediate and sustained-release solid oral dosage forms.

Final Answer: Rate of solute dissolution from solid matrices

Answer: (B)

Go Back to Question 17

Q18.

Solution

Concept:

Carbohydrate classification depends on the accessibility of functional groups within cyclic hemiacetal or hemiketal structures. If these groups can readily reopen into acyclic chain forms, they can act as reducing agents in standard analytical redox tests.

Solution:

Step 1: Define the mechanism of Benedict's and Fehling's tests. These diagnostic tests rely on the oxidation of an organic carbonyl group by copper ions (Cu^{2+}), reducing them to a brick-red precipitate of cuprous oxide (Cu_2O).

Step 2: Determine what structural feature allows a sugar to reduce these reagents. A sugar must possess an uncomplexed, free anomeric hydroxyl group at its C-1 (aldose) or C-2 (ketose) position.

Step 3: Analyze why non-reducing sugars fail this test. In non-reducing sugars like sucrose, the anomeric carbons of both monomer units are linked via a glycosidic bond, preventing ring reopening. Thus, a free, uncomplexed anomeric hydroxyl group is the key structural feature that defines a reducing sugar.

Final Answer: Presence of an uncomplexed, free anomeric hydroxyl group

Answer: (A)

Go Back to Question 18

Q19.

Solution

Concept:

The specialized cardiac conduction system relies on neuromuscular tissues that exhibit autorhythmicity, generating spontaneous action potentials to drive synchronized myocardial contractions. The component with the fastest intrinsic rate of phase-4 depolarization dictates the baseline heart rate.

Solution:

Step 1: Review the intrinsic firing rates of different components of the cardiac conduction system.

Step 2: Compare the firing frequencies of each node. The Purkinje fibers discharge at an intrinsic rate of 15 to 40 times per minute, while the Atrioventricular (AV) node fires at approximately 40 to 60 beats per minute.

Step 3: Identify the highest frequency generator. The Sinoatrial (SA) node, located in the superior wall of the right atrium, exhibits an intrinsic pacemaker rate of 70 to 80 action potentials per minute. This high rate suppresses downstream pacemakers, making the SA node the primary pacemaker of the human heart.

Final Answer: Sinoatrial Node (SA Node)

Answer: (C)

Go Back to Question 19

Q20.

Solution

Concept:

Epidemiological terminology classifies the transmission patterns, spatial distributions, and temporal variations of infectious conditions within human populations using precise definitions based on disease prevalence.

Solution:

Step 1: Define a sporadic pattern. A sporadic disease occurs irregularly and infrequently in a scattered, unpredictable manner across a population.

Step 2: Define epidemic and pandemic patterns. An epidemic describes a sudden outbreak that significantly exceeds normal baseline expectations, while a pandemic represents an epidemic that has spread across multiple countries or continents.

Step 3: Analyze the condition described in the prompt. A disease that maintains a constant, continuous baseline presence within a defined geographic region or population group is classified as an endemic disease.

Final Answer: Endemic

Answer: (B)

Go Back to Question 20

Q21.

Solution

Concept:

Organophosphate poisonings involve the irreversible phosphorylation and inhibition of the acetylcholinesterase (AChE) enzyme, causing an accumulation of acetylcholine (ACh) at muscarinic and nicotinic receptor sites. Managing this crisis requires a competitive antagonist to prevent toxic overstimulation of these receptors.

Solution:

Step 1: Identify the clinical symptoms of an organophosphate overdose. Excess acetylcholine triggers severe muscarinic overstimulation, resulting in salivation, lacrimation, urination, defecation, and bronchoconstriction.

Step 2: Choose an antidote to counteract these muscarinic effects. A competitive antagonist is needed to block muscarinic acetylcholine receptors and displace the excess acetylcholine.

Step 3: Select the appropriate pharmacological agent. Atropine is a tertiary amine alkaloid that acts as a highly effective competitive muscarinic antagonist, reversing life-threatening symptoms like bradycardia and bronchoconstriction. This makes it the primary antidote for managing organophosphate poisoning.

Final Answer: Atropine

Answer: (B)

Go Back to Question 21

Q22.

Solution

Concept:

Crude drug extraction techniques utilize specific temperature profiles and solvent contacts to optimize the mass transfer of active secondary metabolites from cellular matrices into a liquid menstruum.

Solution:

Step 1: Differentiate between common cold extraction methods. Infusion involves a brief steeping period in boiling water without continuous external heating, while maceration requires soaking the drug mass at room temperature for several days.

Step 2: Analyze hot extraction methods. Decoction involves boiling the drug material in water for a fixed duration, which can degrade heat-sensitive compounds.

Step 3: Evaluate the process described in the prompt. An extraction process that combines standard maceration with continuous, gentle heating below the boiling point of the solvent is defined as digestion. This approach accelerates solvent penetration and dissolution without causing thermal degradation.

Final Answer: Digestion

Answer: (B)

Go Back to Question 22

Q23.

Solution

Concept:

The Narcotic Drugs and Psychotropic Substances (NDPS) legislation works alongside individual schedules within the Drugs and Cosmetics Rules to regulate the manufacturing and sales tracking of habit-forming, dangerous, or heavily restricted chemical entities.

Solution:

Step 1: Identify the specific drug class mentioned in the prompt. Phenobarbital is a long-acting barbiturate used as an anticonvulsant and sedative-hypnotic, classifying it as a psychotropic substance with high potential for misuse.

Step 2: Evaluate the schedules within the Drugs and Cosmetics Act. Schedule H requires a standard prescription registry, while Schedule G covers drugs that must be taken under medical supervision.

Step 3: Identify the schedule for highly restricted psychotropic agents. Schedule X includes specific central nervous system depressants, stimulants, and habit-forming psychotropic substances like Phenobarbital. This schedule mandates special licensing, separate double-locked storage, and preservation of all sales records for a minimum of two years.

Final Answer: Schedule X

Answer: (A)

Go Back to Question 23

Q24.

Solution

Concept:

Aminoglycoside antibiotics are highly polar, bactericidal compounds that target protein synthesis in susceptible bacterial strains. Their uptake into cells requires an oxygen-dependent active transport mechanism, and they alter translation fidelity by binding to specific ribosomal subunits.

Solution:

Step 1: Identify the molecular target of aminoglycosides. Streptomycin enters the bacterial cell envelope and binds directly to the 30S core ribosomal subunit.

Step 2: Trace the downstream functional consequences of this binding. Interacting with the 30S subunit causes a conformational change in the A site of the ribosome, leading to misreading of the genetic code on the mRNA strand.

Step 3: Analyze the effect on bacterial survival. This misreading leads to the synthesis of non-functional or toxic proteins that insert into the bacterial cell membrane, disrupting its integrity and causing cell death. This mechanism defines the bactericidal action of Streptomycin.

Final Answer: Binding to the 30S ribosomal subunit, causing misreading of mRNA

Answer: (B)

Go Back to Question 24

Q25.

Solution

Concept:

Clinical pathology tests utilize specialized serological assays to identify infectious diseases. These tests detect specific antibodies in a patient's serum that are generated in response to surface antigens of invading pathogens.

Solution:

Step 1: Identify the disease and causative agent mentioned in the prompt. Typhoid fever is a systemic infection caused by the bacterium *Salmonella typhi*.

Step 2: Evaluate the diagnostic utility of the options. The Dick test assesses susceptibility to scarlet fever, the Schick test checks for immunity to diphtheria, and the Mantoux test is a skin test for tuberculosis exposure.

Step 1: Describe the mechanism of the remaining option. The Widal test is an agglutination assay that detects serum antibodies against the O (somatic) and H (flagellar) antigens of *Salmonella typhi*. This specific serological profiling confirms a diagnosis of typhoid fever.

Final Answer: Widal Test

Answer: (B)

Go Back to Question 25

Q26.

Solution

Concept:

Pharmaceutical packaging science evaluates container configurations to safeguard labile drug substances against environmental degradation factors, such as atmospheric oxygen, moisture ingress, and actinic light transmission.

Solution:

Step 1: Analyze how light degrades chemical formulations. Ultraviolet and short-wavelength visible light can trigger photolysis, free radical generation, and oxidation of sensitive drug molecules.

Step 2: Evaluate the protective properties of different glass types. While Type I borosilicate clear glass provides excellent chemical resistance, its transparency allows UV light to pass through.

Step 3: Explain the role of amber-colored glass. Incorporating iron oxide into soda-lime or borosilicate glass formulations creates an amber tint. This coloring effectively absorbs and filters out light wavelengths between 290 and 450 nm, protecting light-sensitive pharmaceutical preparations from photolytic degradation.

Final Answer: Amber-colored Soda-lime glass

Answer: (B)

Go Back to Question 26

Q27.

Solution

Concept:

A physiological buffer system consists of a mixture of a weak acid and its conjugate base. This system maintains a stable pH by neutralizing small additions of strong acids or bases through shifting chemical equilibria, as described by Le Chatelier's principle.

Solution:

Step 1: Analyze the chemical response when a strong acid, such as hydrochloric acid (HCl), enters a buffer system. The acid dissociates completely, releasing an excess of hydronium ions (H_3O^+).

Step 2: Identify the component of the buffer that responds to this increase in acidity. The conjugate base (A^-) present in the buffer solution reacts with these free hydronium ions.

Step 3: Determine the outcome of this reaction. This interaction converts the strong acid into a weak, largely un-ionized acid (HA), neutralizing the excess hydronium ions and preventing a significant drop in pH.

Final Answer: The conjugate base reacts with excess hydronium ions to form a weak acid.

Answer: (A)

Go Back to Question 27

Q28.

Solution

Concept:

Pharmacokinetic processes dictate the systemic absorption and distribution profiles of orally administered medications. Drugs absorbed from the gastrointestinal tract enter the portal venous system, forcing them to pass through the primary metabolic organ of the body before reaching systemic circulation.

Solution:

Step 1: Trace the anatomical pathway of an oral dosage form. Following dissolution and absorption across the intestinal mucosa, the drug molecules enter the portal vein.

Step 2: Identify the next destination in this pathway. The portal vein delivers the absorbed drug directly to the liver.

Step 3: Analyze the enzymatic processes within this organ. The liver contains high concentrations of metabolic enzymes, including cytochrome P450 complexes. If a drug is a highly efficient substrate for these enzymes, a significant fraction of the active dose is metabolized and inactivated during this initial pass.

Step 4: Define this phenomenon. This pre-systemic elimination process is termed first-pass metabolism, and it significantly reduces the net systemic bioavailability of oral formulations.

Final Answer: First-pass metabolism

Answer: (C)

Go Back to Question 28

Q29.

Solution

Concept:

Epithelial tissues are structurally classified based on their cellular geometry, stratification patterns, and specialized physiological roles within different organ systems.

Solution:

Step 1: Analyze the physical demands of the urinary tract. The urinary bladder experience significant volume changes, requiring an epithelial lining that can expand and contract without tearing.

Step 2: Evaluate the cellular characteristics of transitional epithelium, also known as urothelium. This specialized, stratified tissue changes its structure based on the distension of the organ.

Step 3: Describe the cell layers in this tissue. In an empty bladder, the superficial layer features large, dome-shaped "umbrella cells". As the bladder fills with urine, these cells shift, flatten, and slide over one another, transitioning to a thin, squamous-like arrangement that accommodates increased volume without compromising tissue integrity.

Final Answer: Transitional epithelium (Urothelium) bondage

Answer: (D)

Go Back to Question 29

Q30.

Solution

Concept:

The ionization state of a weak acidic drug is governed by the relation between the environmental pH and the molecule's unique acid dissociation constant (pK_a). This relationship is modeled by the Henderson-Hasselbalch equation:

$$pH = pK_a + \log\left(\frac{[\text{Ionized}]}{[\text{Unionized}]}\right)$$

Solution:

Step 1: Substitute the condition given in the prompt into the equation, where $pH = pK_a$.

$$pK_a = pK_a + \log\left(\frac{[\text{Ionized}]}{[\text{Unionized}]}\right)$$

Step 2: Subtract pK_a from both sides of the equation to isolate the logarithmic term:

$$0 = \log\left(\frac{[\text{Ionized}]}{[\text{Unionized}]}\right)$$

Step 3: Take the antilogarithm (10^0) of both sides:

$$10^0 = \frac{[\text{Ionized}]}{[\text{Unionized}]} \implies 1 = \frac{[\text{Ionized}]}{[\text{Unionized}]}$$

Step 4: Conclude that the concentration of the ionized form equals the concentration of the unionized form. This creates an exact $1:1$ ratio, meaning the drug is precisely 50% ionized and 50% unionized at this pH.

Final Answer: 1:1

Answer: (B)

Go Back to Question 30

Q31.

Solution

Concept:

Official compendial limit tests use colorimetric precipitation or complexation reactions to detect trace chemical impurities within pharmaceutical raw materials under controlled conditions.

Solution:

Step 1: Review the chemical principles of the official limit test for Iron. This test relies on the reaction of iron with thioglycolic acid in a medium buffered with citric acid and made alkaline with ammonia.

Step 2: Identify the final colored complex. The reaction generates a pale pink to deep reddish-purple coordination complex of ferrous thioglycolate.

Step 3: Pinpoint the specific role of thioglycolic acid. Any ferric (Fe^{3+}) ions present in the sample must be reduced to ferrous (Fe^{2+}) ions to form the uniform colored complex. Thioglycolic acid serves a dual role by acting as a reducing agent to convert Fe^{3+} to Fe^{2+} and functioning as the complexing agent that develops the stable analytical color.

Final Answer: Thioglycolic acid

Answer: (B)

Go Back to Question 31

Q32.

Solution

Concept:

Hospital clinical pharmacy departments use structured drug distribution systems to manage medication logistics, balance delivery speeds, reduce compounding errors, and maintain inventory control across different clinical wards.

Solution:

Step 1: Identify the main types of institutional drug distribution networks. These include individual prescription order systems, complete floor stock systems, and unit dose dispensing frameworks.

Step 2: Define the operational mechanics of a floor stock system. In this model, a standardized supply of frequently used, non-charge, or emergency medications is stored directly within the nursing station or ward floor pantry rather than being dispensed from the central pharmacy for each individual order.

Step 3: Select the option that aligns with this definition. This system allows staff nurses to access and administer common medications immediately, reducing delivery delays for routine clinical care supplies.

Final Answer: Non-charge health supplies and common drugs are stored directly in the nursing station.

Answer: (B)

Go Back to Question 32

Q33.

Solution

Concept:

Solid oral dosage form design incorporates specific functional excipients to optimize the mechanical flow, compression behavior, and dissolution profiles of granulations during high-speed industrial manufacturing.

Solution:

Step 1: Differentiate between the auxiliary excipients used in tablet manufacturing. Glidants improve powder flow by reducing inter-particulate friction, while disintegrants facilitate tablet breakup upon contact with moisture.

Step 2: Focus on the specific mechanical challenge described in the prompt. During the high-pressure compression cycle, granules can adhere to the metallic surfaces of the punch faces and die walls, causing defects like sticking or picking.

Step 3: Identify the additive that prevents this mechanical adhesion. Lubricants are hydrophobic agents added to the formulation to reduce friction between the tablet mass and the metal die components, ensuring smooth ejection of the compressed tablet.

Final Answer: Lubricant

Answer: (C)

Go Back to Question 33

Q34.

Solution

Concept:

Narcotic analgesics interact with endogenous opioid receptors within the central and peripheral nervous systems to modulate pain signaling pathways through G-protein coupled mechanisms.

Solution:

Step 1: Identify the primary active alkaloid extracted from *Papaver somniferum*. Morphine is a potent analgesic used to manage severe, acute, and chronic pain.

Step 2: List the major classes of opioid receptors distributed throughout the central nervous system. These include the μ (mu), δ (delta), and κ (kappa) receptors.

Step 3: Identify the specific receptor that mediates morphine's main therapeutic effects. Morphine acts as a potent agonist primarily at the G-protein coupled μ-opioid receptor. Activating this receptor inhibits adenylate cyclase, closes voltage-gated calcium channels, and opens potassium channels, hyperpolarizing neurons to suppress the transmission of nociceptive pain signals.

Final Answer: μ (Mu)-Opioid receptor

Answer: (B)

Go Back to Question 34

Q35.

Solution

Concept:

Organic reaction mechanisms involve transient, highly reactive intermediates whose geometry, orbital hybridization, and electron configurations dictate the stereochemical outcomes of addition and substitution transformations.

Solution:

Step 1: Analyze the valence shell configuration of a classic carbocation intermediate (R_3C^+). The central carbon atom shares a total of six valence electrons through three covalent sigma bonds, leaving one positive formal charge.

Step 2: Determine the optimal hybridization state to minimize electron pair repulsion for three sigma bonding pairs. The central carbon adopts an sp^2 hybridization state.

Step 3: Deduce the spatial geometry from this hybridization. An sp^2-hybridized carbon distributes its three bonding orbitals symmetrically at 120° angles within a single geometric plane. This creates a trigonal planar spatial configuration with an empty, unhybridized p-orbital oriented perpendicularly to the molecular plane.

Final Answer: Trigonal planar, sp^2

Answer: (A)

Go Back to Question 35

Q36.

Solution

Concept:

Pharmaceutical nomenclature defines individual sub-disciplines according to their clinical focus, operational parameters, or chemical methodologies.

Solution:

Step 1: Analyze the etymology of the term "Posology". It is derived from the Greek words *posos*, meaning "how much", and *logos*, meaning "science or study".

Step 2: Correlate this etymology with its definition in pharmaceutical practice. Posology is the specialized branch of medicine and pharmacy dedicated to studying appropriate drug dosages.

Step 3: Describe the factors evaluated within this discipline. It sets standard dosage guidelines and calculates adjustments based on patient-specific variables, including age, body weight, sex, renal function, and underlying clinical conditions.

Final Answer: The science of determining appropriate doses of medicines for various patient conditions

Answer: (B)

Go Back to Question 36

Q37.

Solution

Concept:

The organs of the human respiratory tract are anatomically divided based on their structural composition, spatial positioning, and primary physiological roles in air conduction, humidification, and vocalization.

Solution:

Step 1: Trace the path of air through the upper respiratory tract. Inspired air travels through the nasal cavities, moves down the pharynx, and passes into the structures responsible for voice production before entering the trachea.

Step 2: Identify the specific organ responsible for phonation. The larynx is a cartilaginous structure that connects the pharynx with the trachea.

Step 3: Describe the specialized structures within this organ. The larynx contains the true vocal cords, which are parallel bands of elastic tissue. As air is exhaled from the lungs, it passes through the larynx and vibrates these cords, producing the sounds required for speech and phonation.

Final Answer: Larynx

Answer: (C)

Go Back to Question 37

Q38.

Solution

Concept:

The biogenetic classification of volatile oils and plant secondary metabolites traces complex molecules back to their fundamental biosynthetic building blocks. These building blocks assemble through predictable head-to-tail condensation pathways.

Solution:

Step 1: Analyze the chemical composition of terpene derivatives found in essential volatile oils. Terpenes are composed of repeating structural blocks containing exactly five carbon atoms (C_5H_8).

Step 2: Identify the specific compound that forms these blocks. This C_5 monomer building block is known as an isoprene unit (2-methyl-1,3-butadiene).

Step 3: Explain the biogenetic assembly process. Phytochemical pathways link these units together via the isoprene rule to form monoterpenes (C_{10}), sesquiterpenes (C_{15}), and diterpenes (C_{20}), which constitute the primary active components of volatile oils.

Final Answer: Isoprene unit

Answer: (A)

Go Back to Question 38

Q39.

Solution

Concept:

The thermodynamic and physical stability of biphasic liquid formulations depends on maintaining a uniform distribution of the internal phase within the continuous external vehicle. Interfacial tension shifts can trigger distinct degradation pathways.

Solution:

Step 1: Analyze reversible emulsion instability. Creaming involves the migration of dispersed droplets under gravity, and flocculation causes loose aggregation of particles; both can be reversed by simple mechanical agitation.

Step 2: Evaluate irreversible emulsion degradation. When internal phase droplets coalesce, they merge into larger drops, completely destroying the uniform dispersion.

Step 3: Describe the final state of this degradation. The internal and external phases completely separate into two distinct, macroscopic liquid layers. This irreversible breakdown is termed cracking or breaking, and the uniform distribution of the medication cannot be restored by shaking.

Final Answer: Cracking (Phase inversion/Breaking)

Answer: (C)

Go Back to Question 39

Q40.

Solution

Concept:

Hospital clinical pharmacy operations manage formulary systems to optimize institutional medication inventories. These systems establish a restricted list of medications approved for procurement and prescribing within the facility.

Solution:

Step 1: Identify the main purpose of a Pharmacy and Therapeutics Committee (PTC) in managing a hospital formulary.

Step 2: Analyze the criteria used to select drugs for inclusion in the formulary. The selection process evaluates several factors to ensure optimal patient care and resource allocation.

Step 3: Balance these competing priorities. An effective formulary balances clinical efficacy, safety profiles, and net financial costs. This systematic review ensures patients receive high-quality, safe care while avoiding the unnecessary costs of stocking redundant or overpriced therapeutic equivalents.

Final Answer: Clinical efficacy, safety profile, and net financial cost of medications

Answer: (B)

Go Back to Question 40

Q41.

Solution

Concept:

Phyto-chemical quality control uses specific colorimetric test reagents to detect the presence of alkaloids in crude plant extracts through distinct chemical reactions.

Solution:

Step 1: Identify the crude drug mentioned in the prompt. Ergot is the dried sclerotium of the fungus *Claviceps purpurea*, and its active components are indole alkaloid derivatives, such as ergotamine and ergometrine.

Step 2: Evaluate standard alkaloid reagents. Mayer's, Dragendorff's, and Wagner's reagents react generally with most alkaloids to form cream, orange-brown, or reddish-brown precipitates, respectively.

Step 3: Identify the specific test for ergot alkaloids. Van Urk's reagent consists of p-dimethylaminobenzaldehyde dissolved in a mixture of sulfuric acid and ferric chloride. This reagent reacts specifically with the indole nucleus of ergot alkaloids, developing a characteristic brilliant blue color that serves as a diagnostic identifier.

Final Answer: Van Urk's reagent

Answer: (A)

Go Back to Question 41

Q42.

Solution

Concept:

Chemical stability studies monitor the primary degradation pathways of functional groups within drug molecules in aqueous environments. These pathways can compromise active content and shelf-life.

Solution:

Step 1: Examine the chemical structure of the functional groups mentioned: esters (R-COO-R') and amides (R-CONH-R').

Step 2: Analyze how these groups interact with an aqueous vehicle. The carbonyl carbon in both ester and amide bonds is highly susceptible to nucleophilic attack by water molecules.

Step 3: Identify the resulting degradation process. This nucleophilic substitution cleaves the functional bonds, breaking down esters into carboxylic acids and alcohols, and amides into carboxylic acids and amines. This water-driven decomposition is defined as hydrolysis, and it represents the primary degradation pathway for these drugs in liquid formulations.

Final Answer: Hydrolysis

Answer: (C)

Go Back to Question 42

Q43.

Solution

Concept:

Drug-drug interactions can occur during the absorption phase in the gastrointestinal tract due to physicochemical complexation between co-administered compounds, altering systemic bioavailability.

Solution:

Step 1: Analyze the chemical properties of oral Tetracycline. The tetracycline molecule contains electron-rich hydroxyl and carbonyl groups that can function as chelating agents.

Step 2: Analyze the composition of typical over-the-counter antacids. These formulations contain multivalent metal cations, such as calcium (Ca^{2+}), magnesium (Mg^{2+}), or aluminum (Al^{3+}).

Step 3: Determine the outcome of co-administering these agents. The metal cations in the antacid react with tetracycline in the gastrointestinal tract, forming an insoluble coordination complex or chelate. This bulky, chelated complex cannot cross the intestinal mucosa, preventing the absorption of tetracycline and significantly reducing its antimicrobial efficacy.

Final Answer: Divalent/trivalent cations in the antacid chelate tetracycline, preventing its gastrointestinal absorption.

Answer: (B)

Go Back to Question 43

Q44.

Solution

Concept:

The human digestive system uses site-specific endopeptidases and exopeptidases to break down complex dietary macromolecules into absorbable nutrients within specific pH environments.

Solution:

Step 1: Identify the specific digestive fluid mentioned. Gastric juice is secreted by the mucosal lining of the stomach and contains hydrochloric acid, which maintains an acidic environment (pH 1.5 to 2.0).

Step 2: Evaluate the enzymes listed in the options. Trypsin is a pancreatic protease that operates in the alkaline environment of the small intestine, while amylase breaks down carbohydrates and lipase digests lipids.

Step 3: Identify the primary gastric protease. Pepsin is secreted as an inactive zymogen (pepsinogen) by chief cells and is activated by gastric acid. It acts as an endopeptidase, cleaving central peptide bonds within proteins to initiate digestion in the stomach.

Final Answer: Pepsin

Answer: (C)

Go Back to Question 44

Q45.

Solution

Concept:

The structure-activity relationship (SAR) and pharmacokinetics of local anesthetics classify these molecules based on the intermediate linkage that connects their lipophilic aromatic ring to a hydrophilic amine group. This linkage determines their metabolic pathway and duration of action.

Solution:

Step 1: Contrast the two major chemical classes of local anesthetics: amino-amides (e.g., lidocaine) and amino-esters (e.g., procaine, tetracaine).

Step 2: Analyze the metabolic stability of these linkages. Amide linkages are metabolically stable and undergo slow hepatic biotransformation.

Step 3: Analyze the vulnerability of ester linkages. Ester bonds are highly susceptible to nucleophilic cleavage. When an amino-ester local anesthetic enters the systemic circulation, it is rapidly broken down by ubiquitous plasma pseudocholinesterase enzymes. This ester hydrolysis causes rapid metabolic inactivation, shortening the drug's duration of action and reducing the risk of systemic accumulation.

Final Answer: Ester link

Answer: (B)

Go Back to Question 45

Q46.

Solution

Concept:

Pharmaceutical unit operations utilize distinct mechanical forces, such as impact, attrition, compression, and shearing, to reduce the particle size of solid materials and increase their effective surface area.

Solution:

Step 1: Analyze the mechanical design of a ball mill. It consists of a rotating horizontal cylinder filled with metallic or porcelain spheres (balls) that act as the grinding media.

Step 2: Trace the movement of the milling media during operation. As the cylinder rotates at an optimal speed, the balls are carried up the wall and cascade down onto the material bed.

Step 3: Define the forces acting on the particles during this cycle. The falling spheres exert a high-velocity force that shatters the material, known as impact. Simultaneously, the rolling movement of the spheres rubs against the particles, grinding them down through a force known as attrition. Therefore, a ball mill achieves size reduction through a combination of impact and attrition.

Final Answer: Combined impact and attrition between cascading spheres and particles

Answer: (C)

Go Back to Question 46

Q47.

Solution

Concept:

Family welfare programs and reproductive health initiatives deploy intrauterine contraceptive devices (IUDs) to provide long-term, reversible contraception by altering the uterine microenvironment.

Solution:

Step 1: Identify the device type mentioned. The Cu-T is a non-hormonal, copper-releasing intrauterine device placed within the uterine cavity.

Step 2: Trace the cellular effects of releasing copper ions into the endometrium. The continuous release of copper ions triggers a localized, sterile inflammatory response within the uterine tissues.

Step 3: Connect this tissue response to its contraceptive effect. This cellular alteration changes the uterine fluid composition, making it toxic to spermatozoa. The response inhibits sperm motility, disrupts acrosomal reactions, and prevents fertilization, making it a highly effective contraceptive method.

Final Answer: Inducing a localized, sterile inflammatory response in the endometrium toxic to spermatozoa

Answer: (C)

Go Back to Question 47

Q48.

Solution

Concept:

Lipid transport and biochemistry classify macromolecular plasma lipoproteins by their densities, lipid-to-protein ratios, and direction of cholesterol transport between the liver and peripheral tissues.

Solution:

Step 1: Contrast the functions of major plasma lipoproteins. Low-Density Lipoprotein (LDL) transports cholesterol synthesized in the liver out to peripheral vascular tissues, where excess accumulation can lead to atherosclerosis.

Step 2: Analyze the role of High-Density Lipoprotein (HDL). HDL particles are responsible for a protective pathway known as reverse cholesterol transport.

Step 3: Describe reverse cholesterol transport. HDL captures excess cholesterol from peripheral tissues and vascular walls, transporting it back to the liver for excretion or conversion into bile acids. This pathway reduces cholesterol accumulation in blood vessels, which is why HDL is commonly referred to as "good cholesterol".

Final Answer: High-Density Lipoprotein (HDL)

Answer: (C)

Go Back to Question 48

Q49.

Solution

Concept:

Microscopic pharmacognostic evaluation identifies powdered crude drugs by detecting unique anatomical benchmarks, cell configurations, trichome structures, or specific mineral crystal inclusions within plant tissues.

Solution:

Step 1: Review the characteristic microscopic features of *Atropa belladonna* leaves (Deadly Nightshade), a member of the Solanaceae family.

Step 2: Evaluate the cellular inclusions found in this species. The parenchymal cells of belladonna leaves contain distinct accumulations of calcium oxalate.

Step 3: Identify the specific crystal morphology. These inclusions form microsphenoidal, sand-like crystal aggregates, commonly referred to as sandy crystals of calcium oxalate. Detecting these microsphenoidal crystals under a microscope serves as a diagnostic feature to confirm the identity of powdered *Atropa belladonna*.

Final Answer: Presence of microsphenoidal (sandy) crystals of calcium oxalate in parenchymal cells

Answer: (A)

Go Back to Question 49

Q50.

Solution

Concept:

Prescription interpretation requires an accurate translation of standard Latin abbreviations and medical terms into clear, unambiguous patient instructions on dispensing labels.

Solution:

Step 1: Analyze the Latin abbreviation given in the prompt: “t.i.d.”.

Step 2: Identify the full Latin phrase from which it is derived. The acronym stands for *ter in die*.

Step 3: Translate this phrase into English dosing instructions. *Ter in die* translates directly to “three times a day”.

Step 4: Differentiate this from other common Latin terms. “Once a day” corresponds to *semel in die* (or *o.d.*), and “immediately” corresponds to *statim* (*stat.*). Therefore, the pharmacist must write “To be taken three times a day” on the label.

Final Answer: To be taken three times a day

Answer: (B)

Go Back to Question 50

Q51.

Solution

Concept:

The eukaryotic endomembrane system consists of distinct compartments that cooperate to manufacture, process, and transport cellular cargo. While translation begins in the cytoplasm or on the rough endoplasmic reticulum, the destination for the sorting, functional structural modification, and packaging of those newly synthesized peptide chains is a distinct collection of flattened membranous sacs.

Solution:

Step 1: Track the path of a secretory protein. Proteins destined for secretion are synthesized by ribosomes attached to the rough endoplasmic reticulum, where they undergo initial folding.

Step 2: Identify the next destination in the pathway. These proteins are transferred via transport vesicles to the cis-face of the Golgi apparatus.

Step 3: Analyze the functional role of this organelle. As the molecules progress through the medial to the trans-cisternae of the Golgi apparatus, they undergo post-translational modifications, including complex glycosylation, sulfation, and phosphorylation.

Step 4: Conclude how secretions are finalized. The Golgi apparatus organizes, concentrates, and packages these processed biochemicals into secretory vesicles that bud off from its trans-face to fuse with the plasma membrane. Therefore, the Golgi apparatus functions as the primary sorting and packaging center.

Final Answer: Golgi Apparatus

Answer: (B)

Go Back to Question 51

Q52.

Solution

Concept:

The commercial cultivation of therapeutic tree species for secondary metabolite extraction requires propagation techniques that ensure high survival rates and preserve chemical yields across generations. Uncontrolled seed broadcasting often leads to high genetic variability and low alkaloid concentrations.

Solution:

Step 1: Identify the agricultural requirements of *Cinchona succirubra* (Rubiaceae). This tree yields quinoline alkaloids, primarily quinine and quinidine, concentrated within its bark tissues.

Step 2: Evaluate standard propagation methods. Cultivating cinchona from seeds can lead to variations in alkaloid production due to cross-pollination.

Step 3: Identify the preferred commercial propagation technique. To maintain uniform, high-yielding plantations, vegetative propagation methods are used. Specifically, patch budding or cleft grafting of high-alkaloid scions onto hardy, disease-resistant rootstocks is the established method. This approach ensures consistent tree development and uniform alkaloid content in the bark.

Final Answer: Vegetative propagation via patch budding or cleft grafting

Answer: (B)

Go Back to Question 52

Q53.

Solution

Concept:

In redox titrations, the stability and volatility of standard solutions govern volumetric accuracy. Iodine solutions change in concentration over time due to the sublimation of elemental iodine and the oxidation of iodide ions by atmospheric oxygen. This variability requires standardization using a stable, high-purity primary chemical standard.

Solution:

Step 1: Analyze the chemical properties of iodine titrations (iodimetry and iodometry). Iodine acts as an oxidizing agent that must be calibrated to determine its precise normality.

Step 2: Evaluate the suitability of the options. Sodium thiosulfate is standardly used as the titrant in the burette, but because it is efflorescent, it acts as a secondary standard that must itself be calibrated.

Step 3: Identify the definitive primary standard for iodine solutions. Arsenic trioxide (As_2O_3) is an established primary standard. It is dissolved in sodium hydroxide to form sodium arsenite, which then reacts with the iodine solution in a precise, reproducible stoichiometric redox reaction under weakly acidic or neutral conditions. This makes it the primary chemical standard for this assay.

Final Answer: Arsenic trioxide

Answer: (B)

Go Back to Question 53

Q54.

Solution

Concept:

Oxazaphorine alkylating agents, such as cyclophosphamide, undergo hepatic biotransformation to generate cytotoxic metabolites that disrupt DNA replication. This metabolic pathway can also yield toxic byproducts that cause specific organ toxicity, which can be mitigated by co-administering protective uroprotective agents.

Solution:

Step 1: Trace the metabolic activation of cyclophosphamide in the liver. Hepatic cytochrome P450 enzymes cleave cyclophosphamide into aldophosphamide, which spontaneously breaks down into phosphoramide mustard and acrolein.

Step 2: Identify the therapeutic and toxic components. Phosphoramide mustard acts as the active alkylating agent that destroys neoplastic cells. Acrolein, however, has no antineoplastic activity and is excreted via the kidneys.

Step 3: Analyze the effect of acrolein on the urinary tract. As acrolein concentrates in the urinary bladder, it binds directly to the mucosal lining, causing severe irritation, irritation-induced sloughing, and microvascular damage. This damage leads to a condition known as sterile hemorrhagic cystitis. This dose-limiting toxicity is managed clinically by aggressive hydration and administering Mesna (Sodium 2-mercaptoethane sulfonate) to neutralize the acrolein.

Final Answer: Sterile hemorrhagic cystitis due to acrolein accumulation

Answer: (C)

Go Back to Question 54

Q55.

Solution

Concept:

Tablet manufacturing using high-speed rotary presses requires precise control over granulation parameters, punch geometry, and compression forces. Deviations in these factors can cause physical defects that compromise structural integrity during or immediately after ejection from the die cavity.

Solution:

Step 1: Define the manufacturing defect known as capping. Capping is characterized by the complete or partial separation of the top or bottom crown of a tablet from the main body.

Step 2: Analyze the mechanical cause of this separation. During the high-speed downward stroke of the punches, air can become trapped within the granule bed inside the die matrix.

Step 3: Track the behavior of the tablet upon decompression. When the compression pressure is released and the tablet is ejected from the die, the entrapped, highly compressed air expands rapidly. If the formulation lacks sufficient binder or contains excessive fine particles, this internal expansion shears the weakest horizontal plane, causing the top of the tablet to separate as a distinct cap.

Final Answer: Entrapment of air within the granules during compression, causing the top of the tablet to separate as a cap.

Answer: (A)

Go Back to Question 55

Q56.

Solution

Concept:

The neuroendocrine system relies on specialized hypothalamic neurons that synthesize peptide hormones. These hormones are transported along axonal pathways down the infundibular stalk to be stored and released from a specialized neurohemal organ, bypasses typical anterior lobe portal structures.

Solution:

Step 1: Differentiate between the lobes of the pituitary gland. The anterior pituitary (adenohypophysis) synthesizes its own hormones (such as GH, ACTH, and prolactin) in response to hypothalamic releasing factors. The posterior pituitary (neurohypophysis) does not synthesize hormones.

Step 2: Identify the site of synthesis for posterior pituitary hormones. Neurons with cell bodies located in the supraoptic and paraventricular nuclei of the hypothalamus synthesize Oxytocin and Antidiuretic Hormone (ADH, also known as Vasopressin).

Step 3: Trace the transport and release pathway. These hormones are packaged into secretory granules and transported down the hypothalamo-hypophyseal tract via axoplasmic flow. They are stored in terminal expansions (Herring bodies) within the posterior pituitary until an electrical stimulus triggers their release into the systemic circulation. This makes ADH the hormone synthesized in these specific nuclei.

Final Answer: Antidiuretic Hormone (Vasopressin)

Answer: (C)

Go Back to Question 56

Q57.

Solution

Concept:

The statutory enforcement framework of the Drugs and Cosmetics Act includes clear legal definitions to distinguish between different types of quality and product violations. This allows regulatory agencies to prosecute manufacturing defects, mislabeling, and counterfeiting under specific provisions of the law.

Solution:

Step 1: Define the legal parameters of a misbranded drug. A product is misbranded if its labeling features misleading claims, or if it fails to state prescribed manufacturing details.

Step 2: Define the parameters of an adulterated drug. A drug is adulterated if it contains filthy substances, or if its manufacturing conditions compromise its purity or strength.

Step 3: Analyze the violation described in the prompt. When a product is labeled to imitate another drug, substitutes a genuine molecule with a different entity, or bears the brand name of another therapeutic agent, it is legally classified as a spurious drug. This classification targets product substitution and intellectual property counterfeiting fraud.

Final Answer: Spurious drug

Answer: (B)

Go Back to Question 57

Q58.

Solution

Concept:

The selection of an injection route must align with the physical form and composition of the dosage entity. Injecting non-aqueous vehicles or particulate matter directly into certain compartments can cause immediate mechanical blockages within the vascular system.

Solution:

Step 1: Analyze the physiological properties of the intravenous (IV) route. Intravenous injections introduce formulations directly into the venous blood stream, requiring immediate mixing and transport through the right side of the heart.

Step 2: Determine the consequence of injecting an oily vehicle or a suspension into the venous system. Oil droplets or solid suspension particles are immiscible with aqueous blood plasma and do not dissolve upon injection.

Step 3: Trace the path of these undissolved materials. The venous flow carries these droplets directly into the pulmonary arterial bed, where the microcapillaries narrow down to micron-scale diameters. The oil or particulate matter plugs these small vessels, causing a fatal pulmonary fat embolism. Therefore, oily and suspension formulations are strictly contraindicated for intravenous administration, though they can be safely given via deep intramuscular routes.

Final Answer: Intravenous route

Answer: (C)

Go Back to Question 58

Q59.

Solution

Concept:

Pharmacognostic classification categorizes crude plant-derived drugs based on their structural organization. Drugs are divided into organized structures that retain cellular plant morphology and unorganized substances derived through specific processing or extraction methods.

Solution:

Step 1: Define an organized crude drug. Organized drugs consist of anatomical plant parts that retain their cellular integrity and microscopic architecture, such as leaves (Digitalis, Senna) or flower buds (Clove).

Step 2: Define an unorganized crude drug. Unorganized drugs lack a cellular structure and are obtained from plants through processes like incision, expression, or extraction. These materials include plant exudates, dried juices, gums, mucilages, and volatile oils.

Step 3: Apply these definitions to the options. Acacia gum is an exudate obtained from the stems and branches of *Acacia senegal* following structural injury. It lacks a cellular matrix and appears as amorphous masses, classifying it as an unorganized drug.

Final Answer: Acacia gum exudate

Answer: (B)

Go Back to Question 59

Q60.

Solution

Concept:

Immunization logistics rely on temperature-controlled supply chains to maintain the structural integrity and potency of temperature-sensitive biological preparations. Exposure to ambient temperatures can cause irreversible denaturation of active viral or bacterial antigens.

Solution:

Step 1: Analyze the physical stability of modern vaccine formulations. Most vaccines are complex biological proteins or nucleic acids that rapidly degrade if exposed to temperatures outside their optimal ranges (typically 2°C to 8°C, or sub-zero for specific live vaccines).

Step 2: Define the role of a cold chain network. A cold chain is an unbroken system of refrigerated production facilities, insulated transport containers, cold storage rooms, and localized ice-lined refrigerators.

Step 3: Identify the primary objective of this system. The system maintains the required low-temperature environment continuously from the point of manufacture through regional storage hubs down to the moment of clinical administration, preventing premature product inactivation.

Final Answer: Maintaining a continuous, low-temperature transport and storage environment for vaccines from manufacture to administration

Answer: (B)

Go Back to Question 60

Q61.

Solution

Concept:

Surfactant molecules are amphiphilic compounds containing both distinct hydrophilic heads and lipophilic tails. When dissolved in an aqueous medium, they accumulate at interfaces, aligning their hydrophobic portions away from the water to lower the system's overall surface tension.

Solution:

Step 1: Trace the behavior of surfactants as concentration increases. At low concentrations, surfactant molecules distribute themselves across the liquid-air interface, causing a continuous, linear drop in surface tension.

Step 2: Identify the threshold where the interface becomes saturated. Once the surface layer is fully packed with surfactant molecules, additional molecules can no longer enter the interface. This specific concentration threshold is the Critical Micelle Concentration (CMC).

Step 3: Analyze the structural changes that occur at the CMC. To minimize thermodynamic instability, any additional surfactant molecules self-assemble into spherical aggregates called micelles within the bulk solution. Beyond this concentration, the surface tension reaches a minimum plateau and remains virtually constant, while physical parameters like electrical conductivity show an abrupt change in slope due to the formation of these larger, aggregated structures.

Final Answer: The electrical conductivity drops while surface tension reaches a minimum plateau.

Answer: (A)

Go Back to Question 61

Q62.

Solution

Concept:

The osteology of the human skull classifies individual elements based on their structural connections. Most skull components are joined by immovably fused fibrous joints called sutures, which protect the underlying neural architecture.

Solution:

Step 1: Analyze the joint structures within the human cranium and face. Bones like the maxilla, zygomatic, and sphenoid are tightly anchored to adjacent bones by ossified sutures, rendering them completely immobile.

Step 2: Identify the bone responsible for mastication. The mandible (lower jaw bone) develops as a separate structural component of the facial skeleton.

Step 3: Describe the articulation of this bone. The condylar processes of the mandible articulate with the mandibular fossae of the temporal bones. This specialized connection forms a freely movable synovial joint known as the temporomandibular joint (TMJ), making the mandible the only movable bone in the human skull.

Final Answer: Mandible

Answer: (B)

Go Back to Question 62

Q63.

Solution

Concept:

The reactivity profiles of unsaturated cyclic hydrocarbons are governed by the stabilization energy of their delocalized electrons. Systems that satisfy Huckel's rule preserve their structural configuration rather than undergoing additions that would disrupt their stabilization.

Solution:

Step 1: Review Huckel's rule for aromaticity. A planar, continuously conjugated cyclic ring system containing exactly $(4n + 2)\pi$ delocalized electrons exhibits high thermodynamic stability, known as aromatic resonance energy.

Step 2: Analyze why these systems resist addition reactions. If an aromatic ring like benzene underwent an electrophilic addition reaction, it would break the conjugated cyclic system, destroying the resonance stabilization.

Step 3: Explain the preference for substitution pathways. To preserve its stable $(4n + 2)\pi$ configuration, the ring undergoes electrophilic substitution. An attacking electrophile bonds to the ring, forming a transient carbocation intermediate that rapidly eliminates a proton (H^+) to restore the fully conjugated aromatic system. This feature defines these substrates.

Final Answer: The high thermodynamic stability of a delocalized $(4n + 2)\pi$ electron ring system

Answer: (B)

Go Back to Question 63

Q64.

Solution

Concept:

Clinical biochemistry uses specific serum enzyme markers to evaluate organ health and pinpoint tissue damage. These intracellular enzymes leak into the systemic blood supply following cell injury or rupture.

Solution:

Step 1: Identify the cellular distribution of Alanine Aminotransferase (ALT) and Aspartate Aminotransferase (AST). These transaminase enzymes are primarily concentrated within the cytoplasm and mitochondria of functional parenchymal cells.

Step 2: Analyze the organ specificity of these enzymes. While AST is also found in cardiac and skeletal muscle tissues, ALT is highly concentrated within hepatocytes, making it a specific biomarker for liver tissue.

Step 3: Interpret elevated serum levels of these enzymes. When hepatocytes experience structural injury, membrane peroxidation, or cell necrosis, their cell walls become permeable, causing ALT and AST to leak into the bloodstream. Therefore, elevated serum levels of these transaminases serve as a classic clinical indicator of hepatocellular damage or active liver injury.

Final Answer: Hepatocellular damage or active liver injury

Answer: (C)

Go Back to Question 64

Q65.

Solution

Concept:

Phytochemistry classifies secondary plant metabolites based on the chemical structure of their aglycone cores and their specific pharmacological actions within biological systems.

Solution:

Step 1: Identify the plant origin of Sennoside A. Sennoside A is an active dimeric glycoside extracted from the leaflets and pods of *Cassia angustifolia* (Senna), which belongs to the Fabaceae family.

Step 2: Analyze the chemical structure of the aglycone core. The core structure consists of a tricyclic aromatic ring system derived from anthracene, specifically forming a rhein-dianthrone derivative during biosynthesis.

Step 3: Connect this structural group to its classification. This configuration places Sennoside A in the class of anthraquinone glycosides. These compounds pass unabsorbed into the large intestine, where bacterial enzymes cleave them to release active anthrones that stimulate peristalsis, acting as stimulant laxatives.

Final Answer: Anthraquinone glycoside

Answer: (B)

Go Back to Question 65

Q66.

Solution

Concept:

Community pharmacy practice includes patient counseling as a critical clinical responsibility. This interactive process provides patients with essential drug information to maximize adherence, prevent medication errors, and improve therapeutic outcomes.

Solution:

Step 1: Define the professional boundaries of a pharmacist. Pharmacists cannot alter drug selections or diagnose underlying pathologies independently, as those actions fall under the legal scope of medical practitioners.

Step 2: Identify the primary purpose of patient counseling during prescription dispensing.

Step 3: Detail the core actions involved in this process. Counseling involves a direct, supportive conversation where the pharmacist reviews how to take the medication, outlines common side effects, discusses storage conditions, and explains relevant dietary or lifestyle restrictions. This ensures the patient understands their treatment regimen and reduces the risk of adverse events.

Final Answer: Verbally reviewing the correct usage, potential side effects, storage, and dietary restrictions with the patient

Answer: (B)

Go Back to Question 66

Q67.

Solution

Concept:

Diuretics are categorized by their specific anatomical site of action and molecular mechanisms within the nephron. High-ceiling loop diuretics target high-capacity ion transport systems to inhibit solute reabsorption.

Solution:

Step 1: Locate the primary site of action for Furosemide. Furosemide operates within the luminal membrane of epithelial cells in the thick ascending limb (TAL) of the loop of Henle.

Step 2: Identify the specific transport protein targeted by this drug. The thick ascending limb expresses a high-capacity $Na^+/K^+/2Cl^-$ cotransporter (NKCC2) that moves these ions out of the tubular fluid.

Step 3: Trace the functional consequences of inhibiting this cotransporter. Furosemide binds reversibly to the chloride-binding site of the NKCC2 protein, blocking its transport function. This inhibition prevents the reabsorption of sodium, potassium, and chloride ions, disrupting the medullary concentration gradient and leading to a significant increase in water and electrolyte excretion.

Final Answer: Selective inhibition of the $Na^+/K^+/2Cl^-$ cotransporter in the thick ascending limb of the loop of Henle

Answer: (B)

Go Back to Question 67

Q68.

Solution

Concept:

Powder rheology and biopharmaceutics evaluate inter-particulate friction and mechanical behavior to optimize industrial processing. The flow properties of bulk powders depend on the relationship between their loose packing volume and their condensed, tapped structural configuration.

Solution:

Step 1: Define the mathematical parameters used to assess powder flow. These include bulk density (ρ_{bulk}), measured after pouring, and tapped density (ρ_{tapped}), measured after mechanical tapping.

Step 2: Analyze the formulas for Carr's Compressibility Index and the Hausner Ratio:

$$\text{Carr's Index} = \frac{\rho_{tapped} - \rho_{bulk}}{\rho_{tapped}} \times 100$$

$$\text{Hausner Ratio} = \frac{\rho_{tapped}}{\rho_{bulk}}$$

Step 3: Connect these ratios to the physical properties of the powder. These calculations measure the powder's ability to settle and condense, reflecting the degree of inter-particulate friction. They provide a standardized method for evaluating flow properties and compressibility characteristics during tablet manufacturing.

Final Answer: Flow properties and compressibility characteristics

Answer: (B)

Go Back to Question 68

Q69.

Solution

Concept:

A formal medical prescription follows a structured format divided into distinct, standardized sections. Each section communicates specific information from the clinician to the pharmacist or the patient regarding the treatment regimen.

Solution:

Step 1: List the primary components of a standard prescription sheet. These include the Superscription (R_x symbol), Inscription (names and quantities of active ingredients), Subscription (compounding instructions for the pharmacist), and Signatura (dosing directions for the patient).

Step 2: Analyze the specific role of the Subscription section.

Step 3: Distinguish it from the other components. While the Inscription specifies the selection of drugs, the Subscription contains explicit directions to the pharmacist regarding the preparation, compounding, or total number of dosage units to dispense. This makes it the correct section for these instructions.

Final Answer: Subscription

Answer: (C)

Go Back to Question 69

Q70.

Solution

Concept:

Endocrine physiology monitors how trace minerals are integrated into the chemical synthesis of specific hormones. These minerals undergo metabolic concentration within specialized glandular tissues to build functional signaling molecules.

Solution:

Step 1: Identify the structural composition of thyroid hormones. The follicular cells of the thyroid gland synthesize thyroglobulin residues that require iodination.

Step 2: Trace the integration of trace elements into these molecules. Active transport mechanisms concentrate iodide ions (I^-) within the thyroid gland. Thyroid peroxidase then oxidizes and attaches these ions to tyrosine rings, forming monoiodotyrosine (MIT) and diiodotyrosine (DIT).

Step 3: Analyze the final structures of Thyroxine (T_4) and Triiodothyronine (T_3). Thyroxine (T_4) contains exactly four iodine atoms covalently bound to its core aromatic structure. This structural requirement makes iodine a critical component for thyroid hormone synthesis.

Final Answer: Iodine

Answer: (B)

Go Back to Question 70

Q71.

Solution

Concept:

Pharmacological antagonism describes mechanisms where the actions of a drug are reduced or neutralized by another agent. Antagonism can occur through direct competition at a single receptor site, chemical neutralization, or through opposing pathways within a tissue.

Solution:

Step 1: Define chemical antagonism. This occurs when two agents react directly with each other in solution to form an inactive complex, such as chelators binding heavy metals.

Step 2: Define competitive pharmacological antagonism. This involves two drugs competing for the same binding site on a single receptor type.

Step 3: Analyze the mechanism shown in the prompt. When Drug A binds to receptor α to produce a response (e.g., epinephrine causing bronchodilation via β_2 receptors) and Drug B binds to a completely separate receptor β to produce the opposite effect on the same tissue (e.g., histamine causing bronchoconstriction via H_1 receptors), the interaction is classified as physiological or functional antagonism.

Final Answer: Physiological (Functional) antagonism

Answer: (C)

Go Back to Question 71

Q72.

Solution

Concept:

Compendial limit tests use specialized apparatus designs to isolate volatile analytical gases while preventing interference from other chemical byproducts. This design ensures that colorimetric indicators respond selectively to the target impurity.

Solution:

Step 1: Review the chemical principles of the Gutzeit limit test for Arsenic. Arsenic impurities are reduced by zinc and hydrochloric acid to generate volatile arsine gas (AsH_3), which travels upward to react with mercuric chloride paper, developing a yellow stain.

Step 2: Identify potential chemical interferences in this reaction. Raw metal and acid samples often contain trace sulfur impurities that can react to generate hydrogen sulfide gas (H_2S).

Step 3: Analyze the effect of unmitigated H_2S gas. If hydrogen sulfide escapes the reaction solution, it will react with the mercuric chloride paper to form a dark lead-like stain, compromising the accuracy of the test.

Step 4: Explain the role of the lead acetate cotton plug. Placing lead acetate cotton wool in the neck of the apparatus traps the escaping H_2S by converting it into an insoluble precipitate of lead sulfide (PbS), allowing only pure arsine gas to reach the indicator paper.

Final Answer: To trap hydrogen sulfide gas impurities which would otherwise stain the test paper

Answer: (C)

Go Back to Question 72

Q73.

Solution

Concept:

Organic oxidation pathways convert carbon-oxygen functional groups based on the structural properties of the substrate and the oxidizing power of the reagent. Strong oxidizing agents can cause over-oxidation in the presence of water.

Solution:

Step 1: Analyze the oxidation of a primary alcohol ($R\text{-}CH_2OH$). The initial oxidation step converts the primary alcohol into an aldehyde (R-CHO).

Step 2: Evaluate the behavior of strong aqueous reagents. Reagents like Jones reagent (CrO_3/H_2SO_4) quickly oxidize the intermediate aldehyde further, converting it into a carboxylic acid (R-COOH).

Step 3: Analyze the specific properties of pyridinium chlorochromate (PCC). PCC is a mild, non-aqueous chromium-based reagent. Because the reaction is conducted in an anhydrous solvent like dichloromethane (CH_2Cl_2), it prevents the formation of the aldehyde hydrate intermediate required for further oxidation. As a result, the reaction stops precisely at the aldehyde stage, making it the major product.

Final Answer: Aldehyde

Answer: (C)

Go Back to Question 73

Q74.

Solution

Concept:

Heavy metal toxicology monitors how toxic ions distribute within human tissues and interfere with biochemical pathways. Lead ions mimic essential physiological divalent cations, disrupting critical enzymatic systems across multiple organs.

Solution:

Step 1: Analyze the molecular mechanism of lead toxicity (Plumbism). Lead (Pb^{2+}) ions bind to sulfhydryl groups, inactivating enzymes like δ-aminolevulinic acid dehydratase and ferrochelatase.

Step 2: Trace the downstream hematopoietic consequences. Inhibiting these enzymes disrupts the heme biosynthetic pathway, leading to microcytic anemia and the characteristic basophilic stippling of erythrocytes.

Step 3: Trace the neurological consequences. Lead crosses the blood-brain barrier and replaces calcium ions, disrupting neurotransmitter release and causing encephalopathy, cognitive deficits, and peripheral neuropathies like wrist drop. Therefore, the central nervous and hematopoietic systems are the primary targets of acute and chronic lead poisoning.

Final Answer: Central Nervous System and Hematopoietic system

Answer: (A)

Go Back to Question 74

Q75.

Solution

Concept:

Hematology classifies the cellular elements of blood based on their morphology, staining properties, and physiological specializations. Certain cell lineages undergo structural modifications during maturation to optimize their transport capacity.

Solution:

Step 1: Review the cellular features of the options. Neutrophils and lymphocytes are white blood cells that maintain functional nuclei to regulate immune responses, while thrombocytes are small cell fragments derived from megakaryocytes.

Step 2: Analyze the maturation process of erythrocytes (Red Blood Cells). During erythropoiesis in the bone marrow, erythroblast precursors contain nuclei to direct the synthesis of hemoglobin proteins.

Step 3: Identify the structural modification that occurs before entering circulation. Before maturing into reticulocytes and entering the bloodstream, the cell extrudes its nucleus and other organelles. This anucleated structure creates a biconcave shape that maximizes surface area and optimizes space for hemoglobin molecules, enhancing respiratory gas transport.

Final Answer: Erythrocyte (Red Blood Cell)

Answer: (B)

Go Back to Question 75

Q76.

Solution

Concept:

Pharmaceutical manufacturing uses specialized material handling systems to transport powders and granulations between processing units. The selection of a conveyor depends on the flow properties of the material and the vertical or horizontal requirements of the transport pathway.

Solution:

Step 1: Analyze the physical properties of the material. Highly cohesive granulated masses tend to clump, stick, or segregate if subjected to unconfined mechanical transport.

Step 2: Evaluate horizontal transport options. Standard belt conveyors and roller beds are effective for horizontal or slightly inclined transport, but they cannot lift cohesive powders vertically into a tablet hopper without causing product loss or contamination.

Step 3: Select the appropriate vertical handling system. A pneumatic conveyor uses enclosed negative or positive air pressure lines to lift powders vertically without mechanical shearing, while a vertical bucket elevator uses a series of anchored buckets to lift cohesive materials continuously. These designs ensure clean, vertical transport directly into the compression hopper.

Final Answer: Pneumatic conveyor or Bucket elevator

Answer: (B)

Go Back to Question 76

Q77.

Solution

Concept:

The evaluation of crude drugs includes identifying forms of adulteration, which range from accidental contamination to deliberate fraudulent substitution. These practices compromise the active chemical profile of the material.

Solution:

Step 1: Define sophistication. This refers to the deliberate addition of an inferior or synthetic substance to mimic a genuine crude drug.

Step 2: Analyze the specific scenario described in the prompt. A sample contains material that is morphologically identical to the genuine species, but the active secondary metabolites have been completely extracted during prior industrial processing.

Step 3: Identify the term for this practice. This deceptive practice is defined as adulteration by exhaustion. Examples include selling spent clove buds or exhausted ginger fibers that look authentic but lack the essential volatile oils responsible for their therapeutic effects.

Final Answer: Adulteration by exhaustion

Answer: (C)

Go Back to Question 77

Q78.

Solution

Concept:

Cellular metabolic pathways are highly compartmentalized within specific sub-cellular domains. This organization separates reactions based on enzyme distributions and the availability of cofactors or electron transport systems.

Solution:

Step 1: Locate the site of aerobic respiration. Pyruvate oxidation, the citric acid cycle (Krebs cycle), and the electron transport chain occur within the mitochondrial matrix and across the inner mitochondrial membrane, requiring oxygen as the terminal electron acceptor.

Step 2: Analyze the enzymes that regulate glycolysis. The ten sequential enzymatic steps that convert glucose into pyruvate or lactate are mediated by soluble proteins that dissolve within the intracellular fluid.

Step 3: Conclude the cellular location. This means anaerobic glycolysis occurs entirely within the aqueous cytosol of the cell, allowing ATP generation to continue independently of mitochondrial oxygen levels.

Final Answer: Cytosol

Answer: (C)

Go Back to Question 78

Q79.

Solution

Concept:

National health initiatives deploy standardized clinical protocols to manage infectious disease endemics. These structured programs monitor patient adherence to complex multi-drug regimens, reducing the risk of treatment failure and the emergence of drug-resistant strains.

Solution:

Step 1: Identify the target disease of the Revised National Tuberculosis Control Programme (RNTCP), now updated to the National Tuberculosis Elimination Programme (NTEP). The program focuses on managing infections caused by *Mycobacterium tuberculosis*.

Step 2: Review the therapeutic options. While Multi-Drug Therapy (MDT) is used for leprosy and HAART is used for HIV, tuberculosis requires a distinct management strategy.

Step 3: Identify the core therapeutic strategy of the program. The cornerstone of this public health program is the deployment of DOTS, which stands for Directly Observed Treatment, Short-course. This strategy mandates that healthcare workers or trained community supervisors directly observe patients swallowing their anti-tubercular medications, ensuring complete adherence and preventing the development of multi-drug resistant strains.

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

Answer: (B)

Go Back to Question 79

Q80.

Solution

Concept:

The design of semi-solid topical formulations uses specific excipients to maintain physical stability and optimize performance on the skin. Evaporation of water can cause product drying, crystal formation, and crusting.

Solution:

Step 1: Identify the functional class of humectants, which include polyols like glycerol, propylene glycol, and sorbitol.

Step 2: Analyze the chemical structure of these molecules. Humectants contain multiple hydroxyl groups (-OH) that allow them to form strong hydrogen bonds with water molecules.

Step 3: Explain their mechanism of action in topical creams and gels. When added to a formulation, humectants attract and retain moisture from the surrounding air and the formulation vehicle, preventing the product from drying out during storage. When applied to the skin, they draw moisture into the stratum corneum, keeping the tissue hydrated and soft.

Final Answer: To prevent the loss of moisture from the preparation and keep the skin hydrated

Answer: (B)

Go Back to Question 80

Q81.

Solution

Concept:

The structure-activity relationship (SAR) of steroidal anti-inflammatory drugs maps how specific functional groups across the cyclopentanoperhydrophenanthrene core govern receptor binding and biological activity.

Solution:

Step 1: Analyze the core cyclopentanoperhydrophenanthrene skeleton common to corticosteroid molecules.

Step 2: Identify the critical structural features required to activate glucocorticoid receptors and trigger anti-inflammatory pathways.

Step 3: Map these key functional groups to their positions on the steroid ring. Binding studies show that a double bond between C-4 and C-5 combined with a ketone group at the C-3 position (Δ^4-3-keto structure) in the A-ring is essential for activity. Additionally, an absolute requirement for glucocorticoid activity is the presence of an 11β-hydroxyl group on the C-ring, which forms vital hydrogen bonds within the receptor pocket. Modifying or removing these groups significantly reduces anti-inflammatory properties.

Final Answer: Presence of a Δ^4-3-keto group in the A ring and an 11β-hydroxyl group

Answer: (B)

Go Back to Question 81

Q82.

Solution

Concept:

The lymphoid system consists of primary and secondary organs that regulate immune responses and monitor blood composition. Certain specialized organs filter blood directly, processing cellular components alongside their immune surveillance duties.

Solution:

Step 1: Review the functions of different lymphoid organs. The thymus regulates T-lymphocyte maturation, while lymph nodes filter interstitial lymph fluid collected from peripheral tissues.

Step 2: Identify the organ integrated into the systemic blood circulatory network. The spleen is a large, highly vascularized secondary lymphoid organ located in the upper left quadrant of the abdomen.

Step 3: Describe the functions of the spleen's white and red pulp. The white pulp monitors the blood for foreign antigens to initiate immune responses. The red pulp contains specialized splenic macrophages that break down aged, damaged, or worn-out erythrocytes, recycling iron components and earning the spleen the nickname "the graveyard of red blood cells".

Final Answer: Spleen

Answer: (C)

Go Back to Question 82

Q83.

Solution

Concept:

Chemical reaction kinetics model how reactant concentrations dictate the rate of degradation over time. Under certain experimental conditions, higher-order reactions can display simplified lower-order kinetics if specific concentration profiles are maintained.

Solution:

Step 1: Write the differential rate equation for a standard second-order reaction involving two distinct reactants, A and B:

$$\text{Rate} = k[\text{A}][\text{B}]$$

Step 2: Analyze the kinetic consequences when one reactant, such as B (often water in a hydrolysis study), is present in large excess relative to the drug concentration A.

Step 3: Determine the effect on concentration changes. Because reactant B is present in excess, its concentration remains virtually constant ($[\text{B}] \approx$ constant) throughout the reaction.

Step 4: Simplify the rate law. The constant value of $[\text{B}]$ can be combined with the initial rate constant k to define a new apparent rate constant ($k' = k[\text{B}]$). This simplifies the rate equation to:

$$\text{Rate} = k'[\text{A}]$$

The reaction now follows apparent first-order kinetics, a phenomenon defined as pseudo-first-order kinetics.

Final Answer: The reaction must involve two reactants where one is present in a large excess, making its concentration virtually constant.

Answer: (A)

Go Back to Question 83

Q84.

Solution

Concept:

Compendial quality control protocols for solid oral dosage forms use mechanical stress tests to ensure tablets can withstand handling. These tests simulate the physical impacts products experience during automated packaging and transport.

Solution:

Step 1: Differentiate between standard tablet evaluation tests. Hardness tests measure diametral crushing strength, while disintegration tests track the time required for a tablet to break down in an aqueous medium.

Step 2: Analyze the test that evaluates resistance to surface wear and abrasion. The friability test measures a tablet's resistance to physical chipping and abrasion when subjected to mechanical tumbling.

Step 3: Describe the operation of a Roche friabilator. A sample of pre-weighed tablets is placed inside a rotating drum with an internal baffle that lifts and drops the tablets from a height of six inches at 25 rpm for four minutes (100 total rotations). The tablets are then dedusted and reweighed to calculate the percentage weight loss, which must not exceed 1.0% to satisfy compendial standards.

Final Answer: Friability test using a Roche friabilator

Answer: (C)

Go Back to Question 84

Q85.

Solution

Concept:

Tannins are complex polyphenolic plant metabolites divided into two major chemical classes: hydrolyzable tannins (pyrogallol derivatives) and condensed tannins (catechin or proanthocyanidin derivatives). These classes exhibit distinct chemical reactivity profiles based on their phenolic hydroxyl patterns.

Solution:

Step 1: Analyze how different tannin classes react with iron salts. Phenolic groups form colored coordination complexes with iron ions.

Step 2: Evaluate the reaction of condensed tannins. Condensed tannins react with ferric solutions to produce a characteristic dark brownish-green coloration.

Step 3: Evaluate the reaction of hydrolyzable tannins. Hydrolyzable tannins, which contain gallic or ellagic acid esters, react with ferric chloride ($FeCl_3$) solutions to form a deep blue-black coordination complex. This distinct color change provides a reliable analytical method for identifying and distinguishing hydrolyzable tannins from condensed variants.

Final Answer: Ferric chloride solution

Answer: (A)

Go Back to Question 85

Q86.

Solution

Concept:

Hospital pharmacy inventory management uses operational metrics to control stock levels, balance warehouse holding costs, and maintain a steady supply of critical medications. Stock levels fluctuate over time based on procurement cycles and clinical consumption rates.

Solution:

Step 1: Analyze the inventory consumption curve. As stock is systematically dispensed to hospital wards, inventory levels drop linearly over time.

Step 2: Define the reorder point or level. The reorder level is a specific inventory threshold higher than the minimum safety stock.

Step 3: Explain the purpose of this threshold. This level is calculated based on daily consumption rates and supplier lead time (the time between placing an order and receiving delivery). Reaching this threshold triggers a new purchase order, ensuring new stock arrives before the existing safety buffer is exhausted, preventing institutional stockouts.

Final Answer: To trigger a new purchase order before the existing safety stock is completely exhausted, preventing stockouts

Answer: (B)

Go Back to Question 86

Q87.

Solution

Concept:

Clinical urinalysis uses biochemical colorimetric tests to detect pathological metabolites in urine. These tests screen for abnormal concentrations of proteins, sugars, ketone bodies, and biliary pigments to evaluate organ function.

Solution:

Step 1: Review the diagnostic utility of the options. Benedict's test detects reducing sugars like glucose, Rothera's test screens for ketone bodies like acetoacetate, and Fouchet's test identifies bile pigments like bilirubin.

Step 2: Analyze the remaining option for bile salt detection. Hay's sulfur test screens specifically for the presence of bile salts (such as sodium taurocholate and sodium glycocholate).

Step 3: Explain the physical mechanism of this test. Bile salts act as natural surfactants that lower the surface tension of urine. In a positive test, dry sulfur powder sprinkled onto the surface of the urine sample sinks to the bottom because the lowered surface tension can no longer support its weight, confirming the presence of bile salts.

Final Answer: Hay's sulfur test

Answer: (B)

Go Back to Question 87

Q88.

Solution

Concept:

The autonomic nervous system is divided into two anatomically and functionally distinct pathways that maintain homeostatic balance through opposing actions on visceral effector organs.

Solution:

Step 1: Analyze the role of the parasympathetic nervous system. This division regulates conserving functions, commonly summarized as "rest-and-digest" or "feed-and-breed" responses.

Step 2: Analyze the role of the sympathetic nervous system. The sympathetic division coordinates involuntary visceral responses during periods of acute stress, physical exertion, or perceived danger.

Step 3: Trace the physiological changes triggered by sympathetic activation. Noradrenergic stimulation triggers a cascade of responses designed to optimize physical performance: it increases heart rate and myocardial contractility, dilates the bronchial airways via β_2 receptors to maximize oxygen intake, and redirects blood flow to skeletal muscles. This functional profile defines the classic "fight-or-flight" emergency response.

Final Answer: Sympathetic nervous system

Answer: (B)

Go Back to Question 88

Q89.

Solution

Concept:

Electrophilic addition reactions of unsymmetrical alkenes follow regioselective pathways governed by the thermodynamic stability of carbocation intermediates during structural transformation sequences.

Solution:

Step 1: Analyze the mechanism of adding a hydrogen halide (H-X) across an unsymmetrical double bond (R-CH=CH_2). The initial step involves an electrophilic attack by a proton (H^+) onto the alkene system.

Step 2: Evaluate the competing pathways for carbocation formation. If the proton adds to the internal carbon, it forms a primary carbocation (R-CH^+-CH_3). If it adds to the terminal carbon, it forms a secondary carbocation (R-CH^+-CH_3).

Step 3: Apply carbocation stability trends. Hyperconjugation and inductive effects make secondary carbocations more stable than primary ones, lowering the activation energy for their formation.

Step 4: Apply Markovnikov's rule. The proton adds preferentially to the carbon atom that already carries the greater number of hydrogen atoms, ensuring the reaction proceeds via the more stable carbocation intermediate. The halide ion then attacks this intermediate to yield the major product.

Final Answer: The hydrogen atom attaches to the carbon atom that has the greater number of hydrogen atoms.

Answer: (B)

Go Back to Question 89

Q90.

Solution

Concept:

Adverse drug reactions include immune-mediated hypersensitivity states classified by their underlying cellular triggers and onset speeds. Immediate type I reactions involve antibody cross-linking that drives systemic degranulation.

Solution:

Step 1: Analyze the mechanism of a Type I hypersensitivity reaction. Exposure to an allergen or drug trigger prompts plasma cells to produce specific Immunoglobulin E (IgE) antibodies, which bind to high-affinity receptors on mast cells and basophils.

Step 2: Trace the effects of re-exposure. Re-exposure cross-links the bound IgE molecules, triggering rapid exocytosis of pre-formed inflammatory mediators, including histamine, leukotrienes, and prostaglandins.

Step 3: Identify the systemic consequences of this mediator release. These chemicals cause widespread endothelial relaxation and increased capillary permeability, leading to systemic vasodilation, a drop in blood pressure, and profound airway smooth muscle constriction. This life-threatening state of circulatory collapse and respiratory distress is defined as anaphylactic shock.

Final Answer: Anaphylactic shock

Answer: (B)

Go Back to Question 90

Q91.

Solution

Concept:

The Pharmacy Act of 1948 established the Pharmacy Council of India (PCI) as a central statutory body tasked with regulating pharmacy education and professional standards across the nation.

Solution:

Step 1: Differentiate between the regulatory responsibilities of different pharmaceutical bodies. Drug pricing is managed by the National Pharmaceutical Pricing Authority (NPPA), while manufacturing licenses are issued by State Licensing Authorities operating under the Drugs Controller General.

Step 2: Identify the statutory mandate of the PCI under Chapter II of the Pharmacy Act.

Step 3: Detail the primary responsibilities of this council. The PCI is responsible for establishing the Minimum Qualification for Registration as a Pharmacist, prescribing uniform educational curricula, inspecting training institutions, and approving courses of study and examinations for pharmacy diplomas and degrees. These regulations maintain high educational standards for entering the profession.

Final Answer: To regulate the educational standards and approve courses of study for registration as a pharmacist

Answer: (B)

Go Back to Question 91

Q92.

Solution

Concept:

The macroscopic anatomy of the respiratory system uses specialized muscular partitions to isolate visceral cavities and drive the volume changes required for pulmonary ventilation.

Solution:

Step 1: Locate the anatomical boundary between the thoracic and abdominal cavities. A broad, dome-shaped musculotendinous sheet separates the superior thoracic structures from the inferior abdominal organs.

Step 2: Identify this muscular structure. The diaphragm forms this primary anatomical partition.

Step 3: Describe the role of the diaphragm during respiration. During quiet inspiration, phrenic nerve stimulation causes the muscular fibers of the diaphragm to contract, flattening the dome and moving it inferiorly. This movement increases the vertical volume of the thoracic cavity, lowering intrathoracic pressure relative to atmospheric pressure and drawing air into the lungs. This makes the diaphragm the principal muscle of inspiration.

Final Answer: Diaphragm

Answer: (B)

Go Back to Question 92

Q93.

Solution

Concept:

Solid-liquid extraction processes use specific physical methods to optimize the mass transfer of soluble secondary metabolites from comminuted plant tissues into a liquid solvent menstruum.

Solution:

Step 1: Contrast common extraction techniques. Maceration involves soaking a drug mass at room temperature in a closed container, while decoction requires boiling the material in water.

Step 2: Analyze the procedural steps of percolation. Percolation uses a specialized cylindrical or conical vessel called a percolator.

Step 3: Trace the flow of solvent through the system. The dried crude drug is moistened with solvent, packed uniformly into the column, and covered with additional extractant. The system is allowed to macerate briefly before a valve is opened, allowing the solvent to flow downward through the packed drug bed under gravity. This continuous displacement extracts the active constituents efficiently, separating the final fluid extract from the spent mass.

Final Answer: Allowing the comminuted drug to stand with solvent before a continuous downward displacement of the extractant through a column of the drug

Answer: (B)

Go Back to Question 93

Q94.

Solution

Concept:

The endocrine pancreas regulates glucose homeostasis through the secretion of counter-regulatory hormones by distinct cell populations within the islets of Langerhans. These hormones respond to shifts in systemic blood glucose levels.

Solution:

Step 1: Identify the cell types within the islets of Langerhans and their secretions. Beta cells synthesize insulin to lower blood glucose, delta cells produce somatostatin, and alpha cells synthesize glucagon.

Step 2: Analyze the metabolic state that triggers the secretion of hyper-glycemic hormones. During fasting or hypoglycemia, falling blood glucose levels prompt alpha cells to release glucagon into the portal circulation.

Step 3: Trace the hepatic pathways activated by this hormone. Glucagon binds to G-protein coupled receptors on hepatocytes, activating adenylate cyclase to trigger glycogenolysis (the breakdown of stored glycogen) and gluconeogenesis (the synthesis of glucose from non-carbohydrate precursors). These pathways release glucose into the bloodstream, elevating blood sugar levels back to baseline.

Final Answer: Glucagon

Answer: (B)

Go Back to Question 94

Q95.

Solution

Concept:

Chemical buffer systems resist changes in pH through the equilibrium established between a weak electrolyte and its corresponding conjugate salt. These systems are classified as acidic or basic based on the dissociation characteristics of their components.

Solution:

Step 1: Analyze the chemical composition of the buffer system mentioned in the prompt. The system consists of ammonium hydroxide (NH_4OH), which is a weak base, mixed with ammonium chloride (NH_4Cl), which acts as its conjugate salt.

Step 2: Apply buffer classification rules. A buffer composed of a weak base and its conjugate salt is classified as a basic buffer system.

Step 3: Determine the functional pH range of this system. The operating pH of a basic buffer is centered around the base dissociation constant (pK_b) of the weak base. For an ammonium hydroxide-ammonium chloride matrix, the chemical equilibrium maintains a stable pH range above 7.0 (typically around pH 9.25), making it a classic basic buffer.

Final Answer: Basic buffer with a stable pH range above 7.0

Answer: (B)

Go Back to Question 95

Q96.

Solution

Concept:

Toxicology classifies structural and functional defects based on the timing of toxin exposure and the specific biological mechanisms disrupted within the host or its offspring.

Solution:

Step 1: Define mutagenicity. This refers to the capacity of an agent to alter genetic sequences by causing permanent structural changes in DNA.

Step 2: Define carcinogenicity. This describes the ability of a substance to trigger uncontrolled cellular proliferation, leading to neoplastic tumors.

Step 3: Analyze the specific toxic effect described in the prompt. The capacity of a chemical or drug to cross the placental barrier and disrupt embryogenesis, resulting in structural malformations or functional abnormalities in the developing fetus, is defined as teratogenicity. Classic examples include thalidomide causing phocomelia during early pregnancy.

Final Answer: Teratogenicity

Answer: (C)

Go Back to Question 96

Q97.

Solution

Concept:

The quality control of liquid crude drugs and essential volatile oils uses physical constants to verify identity and detect adulteration. Compounds containing asymmetric carbon centers can rotate polarized light in predictable ways.

Solution://

Step 1: Identify the optical phenomenon described. When monochromatic plane-polarized light passes through a liquid containing chiral molecules, the orientation of the light vector shifts.

Step 2: Define the standardized metric used to quantify this behavior. The absolute angular rotation measured by a polarimeter depends on path length and solution concentration.

Step 3: Define specific optical rotation. To create a standardized physical constant, measurements are normalized to a path length of 1 decimeter (10 cm) and a concentration of 1 g/mL at a fixed temperature and wavelength (typically the sodium D line). This specific optical rotation serves as a compendial value to confirm the purity of volatile oils.

Final Answer: Specific optical rotation

Answer: (B)

Go Back to Question 97

Q98.

Solution

Concept:

Institutional drug distribution systems organize medication logistics to maximize dispensing accuracy and reduce clinical transit delays. Unit dose systems prepare individually packaged, pre-labeled doses for patient administration.

Solution:

Step 1: Analyze a centralized unit dose system. In a centralized system, all individual doses are packaged and distributed from a single, main pharmacy location within the hospital facility.

Step 2: Define the operational structure of a decentralized unit dose system. This model uses small satellite pharmacies located directly on individual nursing floors or within specific clinical wards.

Step 3: Identify the primary operational benefit of this arrangement. The satellite units store, check, and dispense pre-packaged unit doses locally. This arrangement keeps pharmacy staff close to clinical areas, speeding up delivery and improving medication tracking compared to a centralized model.

Final Answer: Satellite pharmacies located on specific nursing floors dispense the individual unit doses.

Answer: (B)

Go Back to Question 98

Q99.

Solution

Concept:

The anatomy of the female reproductive system includes specific structures for oocyte maturation, transport, implantation, and gestation. Following ovulation, specialized tubes capture the mature egg cell to guide its transit toward the uterine cavity.

Solution:

Step 1: Trace the path of an ovulated oocyte. The mature ovum is released from the ovarian follicle into the peritoneal cavity and drawn into the infundibulum of the Fallopian tube by its fringed fimbriae.

Step 2: Identify the site of embryo development. The muscular uterus serves as the site for blastocyst implantation and gestation along its endometrial lining, while the cervix functions as a protective sphincter.

Step 3: Pinpoint the location where fertilization occurs. The sperm cells swim through the cervical canal and uterine cavity to enter the Fallopian tubes (Oviducts). Fertilization standardly occurs within the widest, thin-walled intermediate section of the tube, known as the ampulla, before the developing zygote travels down to the uterus.

Final Answer: Fallopian tubes (Oviducts, specifically the ampulla)

Answer: (B)

Go Back to Question 99

Q100.

Solution

Concept:

The legal framework of the Drugs and Cosmetics Rules regulates the sale and record-keeping of specific prescription drugs to prevent misuse and maintain accountability. Different schedules carry distinct requirements for retail tracking and storage.

Solution:

Step 1: Identify the purpose of Schedule H under the Drugs and Cosmetics Act. Schedule H includes prescription-only medications, such as antibiotics, specific hormones, and central nervous system agents, that carry risks if misused without medical supervision.

Step 2: Review the legal requirements for dispensing these drugs. Schedule H medications cannot be sold over the counter; they can only be dispensed against a valid prescription from a Registered Medical Practitioner.

Step 3: Detail the record-keeping responsibilities of the pharmacy. The dispensing pharmacist must record every transaction in a dedicated prescription register, noting the date, patient details, prescriber's name, and the specific quantity dispensed. These records must be maintained on the premises for a minimum of two years for inspection by drug authorities, making this a core legal requirement.

Final Answer: They must be stored in a separate locked cabinet and can only be sold to patients with a valid prescription, with details recorded in a prescription register.

Answer: (A)

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Answer Key

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