

JELET Pharmacy Sample Paper-5

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 is primarily responsible for the absorption of a highly lipophilic drug across the gastrointestinal tract membrane?
- (A) Passive non-ionic diffusion
(B) Active transport
(C) Facilitated diffusion
(D) Pinocytosis
- Q2.** What is the fundamental function of the Golgi apparatus within a mammalian cell?
- (A) Modification, sorting, and packaging of proteins
(B) ATP generation via oxidative phosphorylation
(C) Initiating cellular apoptosis and autophagy
(D) Protein translation directly from mRNA
- Q3.** Under the Drugs and Cosmetics Act 1940, the requirements, factory premises, and hygienic conditions for manufacturing medical devices are governed specifically under which schedule?



- (A) Schedule M-III
- (B) Schedule M
- (C) Schedule N
- (D) Schedule X

Q4. Which of the following reagents is universally employed in the European Pharmacopoeia limit test for iron to produce a characteristic reddish-purple color?

- (A) Thioglycollic acid
- (B) Citric acid
- (C) Ammonium mercaptoacetate
- (D) Potassium ferricyanide

Q5. A buffer solution is prepared by mixing a weak acid ($pK_a = 4.76$) with its conjugate base. If the ratio of the concentration of the conjugate base to the weak acid is exactly 10 : 1, what is the resulting pH of the buffer?

- (A) 5.76
- (B) 3.76
- (C) 4.76
- (D) 6.76

Q6. Identify the primary skeletal muscle that plays the most vital role during quiet, resting respiration by expanding the thoracic cavity vertically.

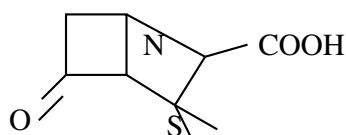
- (A) Diaphragm
- (B) External intercostals
- (C) Internal intercostals
- (D) Rectus abdominis

Q7. In hospital inventory management, ABC analysis is strictly categorized based on which parameters of the stored inventory items?



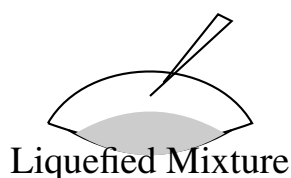
- (A) Annual consumption value
- (B) Criticality and vital nature of drugs
- (C) Lead time of procurement
- (D) Unit price only

Q8. Which structural element is a characteristic feature of all penicillin derivatives that makes them highly susceptible to bacterial enzymatic inactivation?



- (A) β -Lactam ring
- (B) Thiazolidine ring
- (C) Acyl side chain
- (D) Thiazole ring

Q9. What type of physical incompatibility occurs when camphor and menthol are rubbed together in a mortar, resulting in the formation of a liquid mixture?



- (A) Eutectic mixture formation
- (B) Liquefaction due to chemical oxidation
- (C) Immiscibility due to phase separation
- (D) Deliquescence through atmospheric absorption

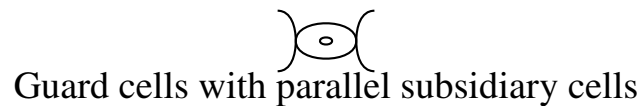
Q10. Which specific cranial nerve is primarily responsible for conducting special sensory information for hearing and equilibrium from the inner ear to the central nervous system?

- (A) Cranial Nerve VIII



- (B) Cranial Nerve V
- (C) Cranial Nerve VII
- (D) Cranial Nerve X

Q11. The presence of explicitly paracytic stomatal arrangement is a distinguishing microscopical diagnostic feature of which of the following crude drugs?



- (A) *Cassia angustifolia*
 - (B) *Digitalis purpurea*
 - (C) *Datura stramonium*
 - (D) *Mentha piperita*
- Q12.** What chemical test is specifically performed to detect the presence of deoxysugars in cardiac glycosides like digitoxin?
- (A) Keller-Kiliani test
 - (B) Legal's test
 - (C) Baljet's test
 - (D) Raymond's test
- Q13.** How many milliliters of a 10% w/v stock solution are required to prepare exactly 500 mL of a 2% w/v solution?
- (A) 100 mL
 - (B) 50 mL
 - (C) 150 mL
 - (D) 200 mL
- Q14.** The condition "Grave's disease" is pathophysiologically characterized by hypersecretion of which of the following endocrine hormones?



- (A) Thyroid hormone
- (B) Cortisol
- (C) Insulin
- (D) Growth hormone

Q15. Which of the following structural changes is a characteristic example of a Phase I metabolic transformation pathways in the liver?

- (A) Aromatic hydroxylation
- (B) Glucuronidation
- (C) Sulfate conjugation
- (D) Acetylation

Q16. Which of the following chemical testing parameters is universally evaluated using the Molisch's test reagent?

- (A) Reducing and non-reducing carbohydrates
- (B) Amino acids with aromatic side chains
- (C) Triglycerides with unsaturated fatty acids
- (D) Purine bases in nucleic acids

Q17. Under the provisions of the National Health Mission (NHM) in India, the primary objective of the Janani Shishu Suraksha Karyakram (JSSK) is to:

- (A) Guarantee completely free and cashless deliveries to pregnant women in public health institutions
- (B) Provide cash incentives to adolescent girls for higher education
- (C) Eliminate nutritional blindness among children aged 1–5 years
- (D) Distribute free oral contraceptive pills in urban slums

Q18. When an aqueous solution of chlorpheniramine maleate is formulated into a parenteral solution, which plastic packaging material is preferred to prevent leaching of plasticizers?

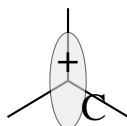


- (A) Type I Borosilicate glass
- (B) Polyvinyl chloride (PVC)
- (C) High-density polyethylene (HDPE)
- (D) Low-density polyethylene (LDPE)

Q19. Which therapeutic agent acts as a selective β_1 -adrenergic receptor antagonist and is routinely indicated for managing chronic hypertension?

- (A) Metoprolol
- (B) Salbutamol
- (C) Prazosin
- (D) Propranolol

Q20. In structural organic chemistry, which of the following intermediate species possesses a planar geometry with an unhybridized p-orbital perpendicular to the plane of the bonds?



- (A) Carbocations
- (B) Free radicals
- (C) Carbanions
- (D) Carbenes

Q21. The clinical manifestation of profound megaloblastic anemia is most commonly secondary to a severe systemic deficiency of which dietary micronutrient?

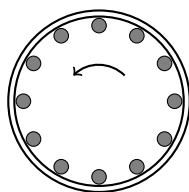
- (A) Cyanocobalamin
- (B) Thiamine
- (C) Riboflavin
- (D) Ascorbic acid



Q22. Which legal body is authorized under the Pharmacy Act 1948 to prescribe the Minimum Qualification required for registration as a pharmacist in India?

- (A) Pharmacy Council of India (PCI)
- (B) Central Drugs Standard Control Organization (CDSCO)
- (C) All India Council for Technical Education (AICTE)
- (D) Ministry of Health and Family Welfare

Q23. During a routine validation run of a pharmaceutical ball mill, increasing the speed of rotation beyond the critical speed results in which phenomenon?



Speed > Critical Speed

- (A) Centrifuging action where balls cling to the inner wall
- (B) Excessive cascading action of balls
- (C) Maximum attrition and impact on particles
- (D) Accelerated wear and tear of the internal liner without size reduction

Q24. In a clinical emergency involving a severe overdose of heparin, which specific agent is administered intravenously as a specific physiological antidote?

- (A) Protamine sulfate
- (B) Vitamin K1
- (C) Aminocaproic acid
- (D) Deferoxamine

Q25. Which enzyme is universally considered the rate-limiting step in the intracellular biochemical pathway of cholesterol biosynthesis?

- (A) HMG-CoA reductase
- (B) HMG-CoA synthase



- (C) Mevalonate kinase
- (D) Squalene epoxidase

Q26. What type of cell in the human gastric mucosa is explicitly responsible for the secretion of intrinsic factor necessary for vitamin absorption?

- (A) Parietal cells
- (B) Chief cells
- (C) G-cells
- (D) Mucous neck cells

Q27. The botanical origin of the crude drug "Ergot" is defined as the dried sclerotium of the fungus *Claviceps purpurea* developing on the plants of:

- (A) *Secale cereale*
- (B) *Digitalis lanata*
- (C) *Papaver somniferum*
- (D) *Atropa belladonna*

Q28. Under the Narcotic Drugs and Psychotropic Substances (NDPS) Act 1985, who holds the ultimate statutory power to license and regulate the cultivation of the opium poppy?

- (A) Central Government
- (B) State Government Pharmacy Council
- (C) Narcotics Commissioner of State
- (D) Drug Controller General of India

Q29. What type of patient counseling strategy is most vital for a patient newly prescribed with a sublingual nitroglycerin tablet for angina?

- (A) Explaining that the tablet must be kept under the tongue and allowed to dissolve without swallowing
- (B) Instructing the patient to swallow the tablet with a full glass of water



- (C) Recommending taking the medication with a high-fat meal to boost absorption
- (D) Advising the patient to crush the tablet and mix it with warm milk

Q30. What is the fundamental mechanism of action of the aminoglycoside antibiotic Gentamicin?

- (A) Binding to the 30S ribosomal subunit causing misreading of mRNA
- (B) Inhibition of bacterial cell wall cross-linking via transpeptidase binding
- (C) Competitive inhibition of dihydropteroate synthase
- (D) Inhibition of topoisomerase II (DNA gyrase)

Q31. Which of the following standard diagnostic biochemical tests is used to confirm a clinical diagnosis of Enteric (Typhoid) fever?

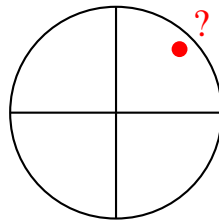
- (A) Widal test
- (B) Dick test
- (C) Schick test
- (D) Weil-Felix test

Q32. While dispensing a prescription, the Latin term "ter in die" (t.i.d.) translates to which specific dosing frequency?

- (A) Three times a day
- (B) Once daily
- (C) Twice daily
- (D) Every alternate day

Q33. Which anatomical component of the human cardiac conduction system acts as the primary intrinsic pacemaker of the heart?





Cardiac Chambers Schematic

- (A) Sinoatrial (SA) node
- (B) Atrioventricular (AV) node
- (C) Bundle of His
- (D) Purkinje fibers

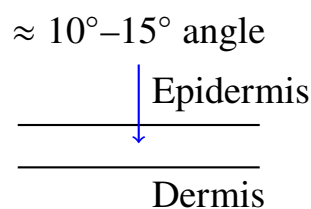
Q34. The primary mechanism of chemical degradation of aspirin (acetylsalicylic acid) in the presence of moisture is:

- (A) Hydrolytic cleavage
- (B) Photolytic oxidation
- (C) Decarboxylation
- (D) Isomerization

Q35. Which of the following is a classic toxic manifestation of chronic lead poisoning (Plumbism)?

- (A) Basophilic stippling of erythrocytes
- (B) Minamata disease
- (C) Argyria
- (D) Pulmonary fibrosis

Q36. According to the current WHO immunization schedule, the Bacillus Calmette-Guérin (BCG) vaccine is administered through which specific route?



- (A) Intradermal
- (B) Intramuscular
- (C) Subcutaneous
- (D) Oral

Q37. Which of the following crude drug evaluation parameters involves the determination of refractive index and optical rotation?

- (A) Physical evaluation
- (B) Morphological evaluation
- (C) Chemical evaluation
- (D) Biological evaluation

Q38. In hospital pharmacy practice, what is the core purpose of maintaining a "Formulary System"?

- (A) To provide an updated list of preferred, clinically evaluated medications available in the facility
- (B) To record the daily financial profit of the pharmacy department
- (C) To list all the names of registered pharmacists working across shifts
- (D) To track the inventory of expired cosmetic formulations

Q39. What is the specific chemical structure class of the structural molecule of Atropine?

- (A) Tropane alkaloid
- (B) Quinoline alkaloid
- (C) Isoquinoline alkaloid
- (D) Indole alkaloid

Q40. Calculate the weight of sodium chloride required to prepare 100 mL of a solution isotonic with blood plasma (0.9% w/v).

- (A) 0.9 g



- (B) 0.09 g
- (C) 9.0 g
- (D) 0.009 g

Q41. Which of the following compounds is chemically classified as an inorganic antacid that can cause systemic metabolic alkalosis upon prolonged or high-dose usage?

- (A) Sodium bicarbonate
- (B) Aluminum hydroxide gel
- (C) Magnesium trisilicate
- (D) Calcium carbonate

Q42. What structural feature characterizes an electrophile in organic chemical reactions?

- (A) An electron-deficient atom capable of accepting an electron pair
- (B) The presence of an unshared pair of electrons
- (C) A net negative formal charge
- (D) High electron density localized on a carbon atom

Q43. The therapeutic category of drugs known as "Statins" primarily targets which endogenous cardiovascular metabolic biomarker to lower plasma levels?

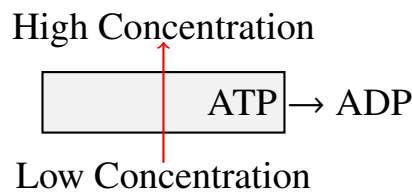
- (A) Low-density lipoprotein (LDL) cholesterol via HMG-CoA reductase inhibition
- (B) High-density lipoprotein (HDL)
- (C) Triglycerides directly via lipolysis
- (D) Chylomicrons clearing rate

Q44. In community pharmacy practice, which of the following is an example of an Over-The-Counter (OTC) medication that does not legally require a prescription for dispensing?



- (A) Paracetamol tablets
- (B) Amoxicillin capsules
- (C) Alprazolam tablets
- (D) Metformin tablets

Q45. The active transport mechanism of nutrients across biological membranes differs from simple passive transport because it:



- (A) Proceeds against a concentration gradient and directly requires metabolic energy (ATP)
 - (B) Moves solutes strictly along their concentration gradient
 - (C) Does not require any specific carrier protein or conformational change
 - (D) Occurs exclusively for highly volatile lipophilic gases
- Q46.** Which structural component of the human eye contains the photoreceptor cells (rods and cones) responsible for transducing light signals into neural impulses?
- (A) Retina
 - (B) Choroid
 - (C) Sclera
 - (D) Cornea
- Q47.** Under the Drugs and Cosmetics Rules 1945, specific guidance on the storage conditions, labeling, and warning statements for prescription-only drugs is categorized under:
- (A) Schedule H
 - (B) Schedule G
 - (C) Schedule X



(D) Schedule P

Q48. In the limit test for arsenic, the function of adding stannous chloride and potassium iodide to the reaction mixture is to:

- (A) Reduce arsenic acid completely to arsenious acid
- (B) Precipitate interfering heavy metallic impurities
- (C) Form a stable blue color complex with silver diethyldithiocarbamate
- (D) Serve as a strong alkaline buffer matrix

Q49. What is the conjugate base of the dihydrogen phosphate ion ($H_2PO_4^-$) according to the Brønsted-Lowry acid-base concept?

- (A) HPO_4^{2-}
- (B) PO_4^{3-}
- (C) H_3PO_4
- (D) OH^-

Q50. Which functional organic chemical reaction mechanism does the alkaline hydrolysis of an alkyl halide to form an alcohol primarily follow when using a tertiary alkyl halide substrate?

- (A) S_N1 mechanism
- (B) S_N2 mechanism
- (C) $E2$ elimination
- (D) Electrophilic addition

Q51. The major mechanism of chemical inactivation of local anesthetics containing an ester linkage, such as procaine, in human plasma is:

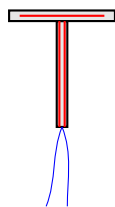
- (A) Hydrolysis via pseudocholinesterase
- (B) Oxidative deamination via monoamine oxidase
- (C) Glucuronide conjugation in the biliary tract
- (D) N-methylation in kidney tubules



Q52. Which of the following clinical tests is standardly implemented to diagnose acute impairment of glomerular filtration rate and kidney function?

- (A) Serum Creatinine Clearance
- (B) Serum Bilirubin
- (C) Alanine Aminotransferase (ALT)
- (D) Alkaline Phosphatase (ALP)

Q53. Which contraceptive method acts primarily by creating a localized inflammatory environment within the uterine cavity that prevents blastocyst implantation?



Schematic Diagram

- (A) Intrauterine Devices (IUDs)
- (B) Oral combined pills
- (C) Subcutaneous implants
- (D) Barrier diaphragms

Q54. During the visual inspection of a finished batch of compressed tablets, the defect known as "Capping" is defined as:



- (A) The partial or complete separation of the top or bottom crowns of a tablet from the main body
- (B) The separation of a tablet into two or more distinct horizontal layers
- (C) The adhesion of tablet formulation materials to the die wall
- (D) Unequal distribution of color across the tablet surface



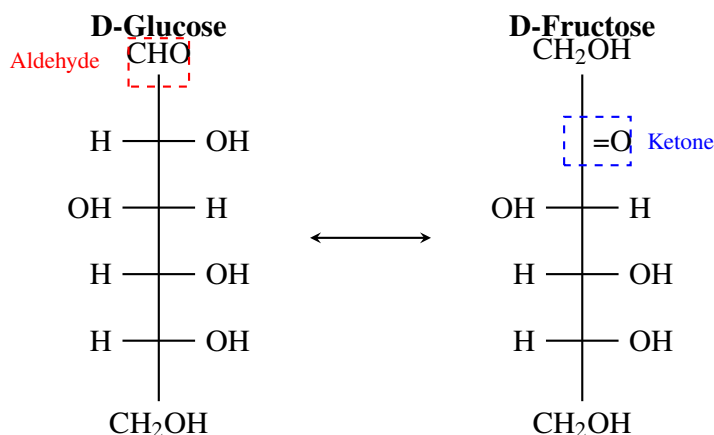
- Q55.** In the compounding of an emulsion using a fixed oil, volatile oil, and mineral oil, what is the primary standard ratio of Oil:Water:Gum required to prepare the primary emulsion using a fixed oil?
- (A) 4 : 2 : 1
(B) 3 : 2 : 1
(C) 2 : 2 : 1
(D) 1 : 2 : 1
- Q56.** Which route of drug administration provides 100% systemic bioavailability by bypassing all physiological barriers to absorption?
- (A) Intravenous
(B) Intramuscular
(C) Subcutaneous
(D) Transdermal
- Q57.** A prescription contains an instruction to dispense a medication for a child. If the adult dose of the drug is 60 mg, what is the calculated dose for a 6-year-old child using Young's Rule?
- (A) 20 mg
(B) 10 mg
(C) 30 mg
(D) 40 mg
- Q58.** Which type of glass container is highly recommended for packaging and autoclaving light-sensitive parenteral preparations due to its high chemical resistance and low hydrolytic alkalinity?
- (A) Type I Borosilicate Glass (Ambered)
(B) Type II Dealkalized Soda-Lime Glass
(C) Type III Regular Soda-Lime Glass
(D) NP General Purpose Soda-Lime Glass



- Q59.** In the design of multi-stage distillation units for manufacturing water for injection, which basic unit operation principle is primarily utilized?
- (A) Heat transfer combined with vapor-liquid phase separation
 - (B) Solid-liquid extraction
 - (C) Size classification via mechanical screening
 - (D) Gas absorption into an inert liquid medium
- Q60.** When compounding a prescription containing iron salts and tannic acid, a visual change is noticed due to the formation of a dark ink-like precipitate. This is categorized as what type of incompatibility?
- (A) Chemical incompatibility
 - (B) Physical incompatibility
 - (C) Therapeutic incompatibility
 - (D) Tolerated incompatibility
- Q61.** Which of the following inorganic pharmaceutical compounds is widely used as a topical astringent and protective agent in calamine lotion formulations?
- (A) Zinc oxide
 - (B) Barium sulfate
 - (C) Sodium thiosulfate
 - (D) Selenium sulfide
- Q62.** What is the fundamental purpose of matching the ionic strength and osmolarity of ophthalmic solutions to that of natural lacrimal fluid?
- (A) To prevent ocular irritation, tissue damage, and lacrimation upon instillation
 - (B) To maximize the systemic absorption of the drug via the nasolacrimal duct
 - (C) To increase the viscosity and contact time of the solution
 - (D) To ensure the chemical stability of the drug molecule against oxidation



Q63. Which type of structural isomerism is demonstrated by the relationship between D-glucose and D-fructose?

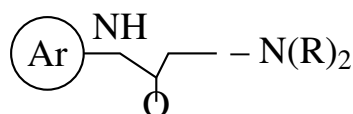


- (A) Functional isomerism
- (B) Enantiomerism
- (C) Geometrical isomerism
- (D) Chain isomerism

Q64. What is the primary therapeutic mechanism of action of the drug Levodopa in the management of Parkinson's disease?

- (A) Metabolic conversion into dopamine in the central nervous system to replenish deficient levels
- (B) Direct block of central post-synaptic dopamine receptors
- (C) Inhibition of peripheral monoamine oxidase-B exclusively
- (D) Enhancement of central GABAergic inhibitory tone

Q65. Which chemical structural moiety is shared by all local anesthetics of the amide class, such as Lidocaine, which distinguishes them from ester-linked anesthetics?



- (A) An amide linkage separating a lipophilic aromatic ring from a hydrophilic amine



- (B) An ester link between an aromatic ring and an amino group
- (C) A free carboxylic acid function attached to a pyridine ring
- (D) A quaternary ammonium head group bound to a long aliphatic chain

Q66. The Arrhenius equation ($\ln k = \ln A - \frac{E_a}{RT}$) is used in pharmaceutical stability studies to evaluate the effect of which environmental parameter on the rate of degradation?

- (A) Temperature
- (B) Relative humidity
- (C) Light intensity
- (D) Hydrogen ion concentration

Q67. Which division of the autonomic nervous system is primarily responsible for triggering the "fight or flight" response, resulting in pupillary dilation and elevated heart rate?

- (A) Sympathetic nervous system
- (B) Parasympathetic nervous system
- (C) Somatic nervous system
- (D) Enteric nervous system

Q68. What is the specific cellular mechanism of action of the loop diuretic Furosemide in the human nephron?

- (A) Inhibition of the $\text{Na}^+/\text{K}^+ / 2\text{Cl}^-$ cotransporter in the thick ascending limb of the loop of Henle
- (B) Inhibition of the Na^+/Cl^- symporter in the distal convoluted tubule
- (C) Antagonism of mineralocorticoid receptors in the collecting duct
- (D) Inhibition of carbonic anhydrase in the proximal convoluted tubule

Q69. The structural framework of the human vertebral column contains how many distinct lumbar vertebrae?



- (A) 5
- (B) 7
- (C) 12
- (D) 4

Q70. Which of the following blood vessels carries deoxygenated blood away from the right ventricle of the heart directly to the respiratory organs?

- (A) Pulmonary artery
- (B) Superior vena cava
- (C) Pulmonary vein
- (D) Aorta

Q71. Which anatomical segment of the human small intestine is the primary site where the majority of enzymatic digestion and nutrient absorption takes place?

- (A) Jejunum
- (B) Duodenum
- (C) Ileum
- (D) Cecum

Q72. The master endocrine gland, the anterior pituitary, secretes which of the following hormones to stimulate glucocorticoid synthesis in the adrenal cortex?

- (A) Adrenocorticotrophic hormone (ACTH)
- (B) Thyroid-stimulating hormone (TSH)
- (C) Luteinizing hormone (LH)
- (D) Prolactin

Q73. The crude drug "Cinchona" is taxonomically classified under which plant family?

- (A) Rubiaceae



- (B) Solanaceae
- (C) Umbelliferae
- (D) Leguminosae

Q74. Which of the following processes describes the method of organized cultivation of medicinal plants under specific ecological conditions to ensure uniform chemical yield?

- (A) Cultivation and propagation
- (B) Wild harvesting
- (C) Adulteration
- (D) Organoleptic evaluation

Q75. The practice of intentionally substituting a genuine crude drug with inferior look-alike materials lacking active constituents is defined as:

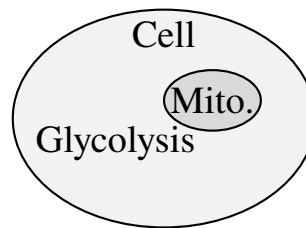
- (A) Adulteration
- (B) Evaluation
- (C) Standardization
- (D) Lycopodium spore analysis

Q76. Which of the following herbal drugs is widely documented in traditional systems and modern phytotherapy for its adaptive, stress-relieving, and immunomodulatory properties?

- (A) Ashwagandha (*Withania somnifera*)
- (B) Digitalis
- (C) Senna
- (D) Clove

Q77. The biochemical process of anaerobic glycolysis occurs exclusively within which cellular compartment?





- (A) Cytoplasm
- (B) Mitochondrial matrix
- (C) Lysosome
- (D) Endoplasmic reticulum

Q78. Which of the following major structural lipid classes is a primary component of biological cell membranes, characterized by a hydrophilic head and two hydrophobic tails?



- (A) Phospholipids
- (B) Triacylglycerols
- (C) Cholesterol esters
- (D) Free fatty acids

Q79. What term defines the non-protein organic molecule that is loosely bound to an enzyme structure and is essential for its catalytic activity?

- (A) Coenzyme
- (B) Apoenzyme
- (C) Holoenzyme
- (D) Zymogen

Q80. In epidemiological surveillance, the term "Prevalence" of a disease refers to:

- (A) The total number of all active cases (both old and new) present in a population at a given point in time



- (B) Only the number of newly diagnosed cases during a specific time interval
- (C) The total number of deaths due to the disease within a year
- (D) The probability of a single individual contracting the disease

Q81. The structural management of a hospital pharmacy store requires maintaining a specific cold chain temperature range for storing vaccines and biological sera. What is this standard temperature range?

- (A) 2°C to 8°C
- (B) -20°C to -8°C
- (C) 8°C to 15°C
- (D) Room temperature (15°C to 25°C)

Q82. In hospital pharmacy practice, which of the following core concepts is evaluated by hospital clinical pharmacists during a medication chart review to optimize therapeutic outcomes?

- (A) Potential drug-drug interactions and dosage appropriateness
- (B) The financial profit margin of the hospital group
- (C) The wholesale vendor's lead time for delivery
- (D) The design layout of the pharmacy storage racks

Q83. Which national public health program in India was specifically launched to control and eliminate a highly contagious chronic bacterial disease affecting skin and peripheral nerves?

- (A) National Leprosy Eradication Programme (NLEP)
- (B) National AIDS Control Programme (NACP)
- (C) National Vector Borne Disease Control Programme (NVBDCP)
- (D) Revised National Tuberculosis Control Programme (RNTCP)

Q84. What is the primary purpose of executing inventory control using the VED analysis framework in a hospital pharmacy setting?



- (A) To classify medicines based on their vital, essential, or desirable nature for patient survival
- (B) To prioritize items based on their annual expenditure values
- (C) To determine the shelf-life stability of biological formulations
- (D) To evaluate the physical dimensions of the storage facility

Q85. Which of the following procedures describes the core operational step in the purchasing and procurement cycle of a hospital pharmacy?

- (A) Issuing a formal purchase order to validated vendors based on inventory requisitions
- (B) Compounding extemporaneous ointments
- (C) Direct clinical monitoring of patient vitals in the ward
- (D) Preparing the hospital's annual financial tax returns

Q86. Under the Pharmacy Act 1948, the Joint State Pharmacy Councils are constituted for what primary purpose?

- (A) To serve the pharmacy registration and regulatory needs of two or more participating states
- (B) To manufacture generic formulations at reduced costs
- (C) To conduct research on new chemical entities
- (D) To regulate the import of medical devices into the country

Q87. Which of the following is a classic clinical manifestation of acute digitalis toxicity due to accumulated doses?

- (A) Visual disturbances like xanthopsia (yellow-green vision) and severe bradycardia
- (B) Marked tachycardia with hypertension
- (C) Acute macrocytic anemia
- (D) Profound respiratory alkalosis



- Q88.** Which biochemical pathway is primarily stimulated by insulin secretion from the pancreas to reduce systemic postprandial blood glucose levels?
- (A) Glycogenesis
 - (B) Gluconeogenesis
 - (C) Glycogenolysis
 - (D) Lipolysis
- Q89.** What morphological type of crude drug classification organizes drugs based on the plant organ from which they are derived, such as leaves, roots, or seeds?
- (A) Morphological classification
 - (B) Alphabetical classification
 - (C) Pharmacological classification
 - (D) Chemotaxonomic classification
- Q90.** During the industrial operation of a fluid bed dryer, the primary mechanism of heat transfer from the drying air stream to the wet granules is:
- (A) Convection
 - (B) Conduction
 - (C) Radiation
 - (D) Dielectric heating
- Q91.** What type of functional chemical bond links individual amino acid units together to form the primary structural sequence of a protein?
- (A) Peptide bond
 - (B) Glycosidic bond
 - (C) Ester bond
 - (D) Phosphodiester bond
- Q92.** What structural type of transport protein is primarily responsible for generating the resting membrane potential across the axolemma of a neuron?



- (A) Na^+/K^+ ATPase pump
- (B) Voltage-gated calcium channels
- (C) Ligand-gated chloride channels
- (D) Aquaporins

Q93. Under the Drugs and Cosmetics Act 1940, what is the minimum statutory age requirement for an individual to be qualified to apply for a license to operate a retail pharmacy?

- (A) 18 years
- (B) 16 years
- (C) 21 years
- (D) 25 years

Q94. Which of the following components of public health engineering is primarily intended to break the chain of transmission of waterborne parasitic and bacterial pathogens?

- (A) Provision of safe water purification and sanitization structures
- (B) Urban noise control mapping
- (C) Monitoring industrial gaseous emissions
- (D) Managing medical radioactive wastes

Q95. What specific clinical advice should a community pharmacist offer to a patient who has been prescribed a course of tetracycline antibiotics?

- (A) Avoid taking the medication with milk, iron supplements, or antacids as they decrease its absorption
- (B) Take the medication with a large glass of whole milk or antacids
- (C) Crush the capsule and dissolve it in fruit juice before taking
- (D) Double the subsequent dose if a single dose is missed

Q96. The structural organic compound benzene is highly stable and resists typical addition reactions because of which electronic property?



- (A) Resonance stabilization and delocalization of π -electrons
- (B) High steric hindrance from hydrogen atoms
- (C) The presence of localized static double bonds
- (D) High electronegativity of its carbon atoms

Q97. Which of the following terms describes the phenomenon where a drug is chemically modified or cleared by liver enzymes during its initial passage through the portal circulation before reaching systemic distribution?

- (A) First-pass metabolism
- (B) Enterohepatic recycling
- (C) Bioactivation
- (D) Glomerular filtration

Q98. Which structural element of the human brain contains the vital reflex centers controlling cardiovascular output and the basic rhythm of respiration?

- (A) Medulla oblongata
- (B) Cerebrum
- (C) Cerebellum
- (D) Thalamus

Q99. What chemical reagent is routinely employed to confirm the presence of alkaloids in a crude drug extract by forming a reddish-brown precipitate?

- (A) Dragendorff's reagent
- (B) Mayer's reagent
- (C) Wagner's reagent
- (D) Hager's reagent

Q100. In clinical pathology, the appearance of significant levels of ketone bodies in a patient's urinalysis report is a major diagnostic hallmark of which uncontrolled metabolic condition?



- (A) Diabetic ketoacidosis
- (B) Chronic glomerulonephritis
- (C) Obstructive jaundice
- (D) Rheumatoid arthritis



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

Drug absorption across biological membranes primarily depends on the physicochemical properties of the drug molecule, such as its lipophilicity, molecular size, and ionization state. The lipid bilayer structure of biological membranes acts as a selectively permeable barrier, favoring the transport of non-ionized, lipophilic substances through passive pathways.

Solution:

Step 1: Analyze the nature of the drug molecule specified in the question. The drug is described as highly lipophilic, which indicates a strong affinity for lipid environments and a high partition coefficient.

Step 2: Evaluate the primary transport pathways across the gastrointestinal tract. Passive non-ionic diffusion is the process where molecules move from an area of higher concentration to lower concentration across a lipid matrix without energy expenditure.

Step 3: Correlate lipophilicity with transport. Because the cell membrane is composed of a phospholipid bilayer, highly lipid-soluble drugs dissolve easily in the membrane matrix, enabling rapid passage down their concentration gradient.

Step 4: Differentiate from active mechanisms. Active transport and facilitated diffusion require specific membrane carriers, which are saturable and typically reserved for hydrophilic or structurally specific endogenous nutrients.

Step 5: Conclude the optimal mechanism. Highly lipophilic substances do not require carriers or energy, making passive non-ionic diffusion the primary and most efficient mode of transaccional transport.

Final Answer:

Answer: (A)

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Q2.

Solution**Concept:**

Eukaryotic cells contain specialized membrane-bound organelles that partition biochemical pathways. The Golgi apparatus plays a key role in the secretory pathway, serving as a central processing, hub-like station positioned structurally between the rough endoplasmic reticulum and the plasma membrane.

Solution:

Step 1: Trace the intracellular pathway of proteins. Proteins are synthesized by ribosomes attached to the rough endoplasmic reticulum and then transferred via transport vesicles to the cis-face of the Golgi apparatus.

Step 2: Examine the modifications within the Golgi cisternae. As proteins move from the cis to the trans network, they undergo enzymatic alterations, including glycosylation, sulfation, and proteolytic phosphorylation.

Step 3: Analyze the sorting mechanism. The Golgi apparatus tags these modified proteins with specific chemical signal markers to direct them to their correct functional cellular destinations.

Step 4: Evaluate the packaging process. Secretory vesicles bud off from the trans-Golgi network, carrying the sorted proteins to lysosomes, plasma membranes, or extracellular environments via exocytosis.

Step 5: Contrast with alternative choices. Oxidative phosphorylation occurs in mitochondria, translation occurs on ribosomes, and autophagy is driven by lysosomal enzymes, leaving protein processing as the definitive function.

Final Answer: Modification, sorting, and packaging of proteins

Answer: (A)

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Q3.

Solution**Concept:**

The Drugs and Cosmetics Act 1940 and Rules 1945 establish statutory legal frameworks regulating the manufacture, distribution, and import of pharmaceuticals and medical devices in India. These regulations use specific alphabetical schedules to define Good Manufacturing Practices (GMP) for different product types.

Solution:

Step 1: Identify the focus of the query. The question targets the legal schedule governing factory premises, hygienic parameters, and compliance conditions specifically for medical devices.

Step 2: Evaluate the scope of Schedule M. While the parent Schedule M establishes basic standard operating guidelines and GMP conditions for general allopathic pharmaceutical formulations, it is split into sub-schedules.

Step 3: Differentiate the specific sub-schedules. Schedule M-I covers homeopathic preparations, Schedule M-II governs cosmetics, and Schedule M-III sets requirements for medical devices and diagnostic kits.

Step 4: Verify against remaining options. Schedule N outlines structural regulations and equipment minimums for running a retail pharmacy shop, while Schedule X controls habit-forming narcotic or psychotropic drugs.

Step 5: Pinpoint the precise designation. Schedule M-III is the dedicated regulatory section detailing manufacturing environments, testing spaces, and quality control systems for certified medical equipment.

Final Answer:

Answer: (A)

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Q4.

Solution**Concept:**

Pharmacopoeial limit tests are semi-quantitative analytical methods designed to detect and restrict trace impurities within chemical compounds. The limit test for iron relies on a coordination chemistry reaction, where a specific organic reagent binds with metal ions to generate a measurable color comparison against a standard.

Solution:

Step 1: Define the objective of the iron limit test. The test detects small amounts of iron impurities by generating a stable, soluble colored complex in an alkaline chemical system.

Step 2: Understand the chemical steps involved. Citric acid is added to the sample mixture to form an iron-citrate complex, which prevents the premature precipitation of iron as ferric hydroxide by ammonia.

Step 3: Analyze the role of the principal color-forming agent. Thioglycollic acid acts as a reducing agent, converting any ferric (Fe^{3+}) ions present in the solution into ferrous (Fe^{2+}) ions.

Step 4: Observe the structural complexation. The thioglycollic acid then reacts directly with the generated ferrous ions in the presence of ammonia to form ferrous thioglycollate, which exhibits a distinctive reddish-purple color.

Step 5: Review international compendia standards. Both the British Pharmacopoeia and European Pharmacopoeia specify thioglycollic acid as the reagent for generating this coordination complex.

Final Answer: Thioglycollic acid

Answer: (A)

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Q5.

Solution**Concept:**

The pH of a buffer solution containing a weak acid and its conjugate base can be quantitatively determined using the Henderson-Hasselbalch equation. This equation establishes a direct mathematical relationship between the hydronium ion concentration, the dissociation constant (pK_a), and the log ratio of the component concentrations.

Solution:

Step 1: State the Henderson-Hasselbalch equation for an acidic buffer system:

$$\text{pH} = pK_a + \log_{10} \left(\frac{[\text{Conjugate Base}]}{[\text{Weak Acid}]} \right)$$

Step 2: Extract the parameters provided in the problem statement. The negative logarithm of the acid dissociation constant (pK_a) is given as 4.76.

Step 3: Identify the molar concentration ratio of the buffer components. The ratio of the conjugate base concentration to the weak acid concentration is explicitly stated to be 10 : 1.

Step 4: Substitute these values into the buffer equation to solve for the final solution pH:

$$\text{pH} = 4.76 + \log_{10}(10)$$

Step 5: Evaluate the logarithmic term. Since $\log_{10}(10) = 1$, the equation simplifies through basic arithmetic addition:

$$\text{pH} = 4.76 + 1 = 5.76$$

Final Answer:

Answer: (A)

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Q6.

Solution**Concept:**

Pulmonary ventilation relies on volume and pressure adjustments within the enclosed thoracic cavity. Muscle groups contract to change the internal dimensions of the chest, creating pressure differentials that drive airflow between the atmosphere and the alveoli.

Solution:

Step 1: Identify the mechanical requirements of quiet, resting inspiration. To draw air inward, the volume of the thoracic cage must expand, which drops intrapleural pressure below atmospheric pressure.

Step 2: Examine the role of the primary inspiratory muscle. The diaphragm is a dome-shaped skeletal muscle plate that separates the thoracic cavity from the abdominal compartment.

Step 3: Analyze the movement during contraction. When the diaphragm receives neural signals, its fibers contract and flatten downward, expanding the vertical dimension of the thoracic cavity.

Step 4: Assess auxiliary respiratory muscles. The external intercostal muscles assist primarily by elevating the ribs to expand the transverse diameter, whereas internal intercostals function during forced exhalation.

Step 5: Conclude the primary driver. The diaphragm performs more than 75% of the structural volume changes during normal, resting respiration, making it the primary muscle of breathing.

Final Answer:

Answer: (A)

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Q7.

Solution**Concept:**

Pharmaceutical inventory control involves materials management strategies designed to optimize stocking patterns, reduce holding costs, and secure resource distribution. The ABC analysis framework classifies inventory items into three distinct tiers based on cost-benefit metrics.

Solution:

Step 1: Understand the operational principle of ABC analysis. This cost-control method follows Pareto's Principle, which states that a small percentage of inventory items often accounts for the majority of total expenditures.

Step 2: Define the primary classification criteria. Items are grouped into categories A, B, or C based on their annual consumption value, calculated by multiplying an item's annual usage volume by its unit cost.

Step 3: Characterize Category A items. These represent a small volume (around 10%–15%) of total items but consume a high proportion (around 70%–80%) of the annual pharmacy budget, requiring strict oversight.

Step 4: Characterize Categories B and C. Category B items show moderate value, while Category C consists of high-volume, low-cost supplies that require minimal management overhead.

Step 5: Differentiate from other analysis types. VED analysis classifies stock by medical criticality (Vital, Essential, Desirable), whereas ABC analysis focuses strictly on annual monetary consumption metrics.

Final Answer: Annual consumption value

Answer: (A)

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Q8.

Solution**Concept:**

The therapeutic efficacy and chemical reactivity of β -lactam antibiotics are closely linked to their structural core geometries. The architectural arrangement of rings creates localized ring strain, making specific cyclic bonds susceptible to nucleophilic attacks.

Solution:

Step 1: Identify the core chemical structure of penicillins. The core structure consists of a fused bicyclic system made of a four-membered ring joined to a five-membered thiazolidine ring.

Step 2: Locate the site of enzymatic vulnerability. The four-membered cyclic amide ring is known as the β -lactam ring, which features an amide bond under significant structural ring strain.

Step 3: Analyze the inactivation mechanism. Bacterial resistance is primarily mediated by β -lactamase enzymes, which mount a nucleophilic attack on the carbonyl carbon of this four-membered ring.

Step 4: Observe the structural outcome. This enzymatic attack breaks the cyclic amide bond, opening the β -lactam ring to produce penicilloic acid, an inactive metabolite that cannot inhibit cell wall synthesis.

Step 5: Confirm the target structure. The β -lactam ring is the essential pharmacophore required for antibacterial action, but its inherent ring strain also makes it highly vulnerable to enzymatic hydrolysis.

Final Answer:

Answer: (A)

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Q9.

Solution**Concept:**

Pharmaceutical incompatibilities occur when mixing components alters the physical state, chemical integrity, or therapeutic efficacy of a formulation. Physical incompatibilities often manifest as visible changes in solubility, phase separation, or aggregation states.

Solution:

Step 1: Define the specific scenario. The problem describes mixing two solid crystalline compounds, camphor and menthol, which liquefy upon close contact at room temperature without forming covalent bonds.

Step 2: Understand the thermodynamics of the mixture. Certain chemical substances, when blended in specific ratios, lower each other's melting points through intermolecular interactions.

Step 3: Identify the technical term for this phenomenon. A mixture that melts at a lower temperature than any of its individual components is called a eutectic mixture.

Step 4: Analyze the physical transition. Because the new melting point of the combined camphor-menthol system drops below ambient room temperature, the solids liquefy during mechanical trituration.

Step 5: Rule out alternative mechanisms. This phase transition is a physical eutectic phenomenon, distinct from chemical oxidation, moisture absorption (deliquescence), or basic fluid immiscibility.

Final Answer:

Answer: (A)

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Q10.

Solution**Concept:**

Cranial nerves emerge directly from the brain and brainstem to provide specialized sensory and motor innervation to the head and neck. These nerve pathways are classified numerically based on their anatomical position along the longitudinal axis of the central nervous system.

Solution:

Step 1: Identify the functional requirement. The question seeks the specific cranial nerve responsible for carrying sensory signals for both hearing (audition) and balance (vestibular equilibrium).

Step 2: Evaluate the physiology of Cranial Nerve VIII. The vestibulocochlear nerve splits into two functional branches within the inner ear: the cochlear nerve and the vestibular nerve.

Step 3: Trace signal transduction. The cochlear branch transmits auditory signals from the organ of Corti, while the vestibular branch carries positional and rotational acceleration updates from the semicircular canals.

Step 4: Exclude alternative cranial pathways. Cranial Nerve V (trigeminal) handles facial sensation, Cranial Nerve VII (facial) controls motor expressions and taste, and Cranial Nerve X (vagus) regulates parasympathetic visceral functions.

Step 5: Match the number to the name. Cranial Nerve VIII is the vestibulocochlear nerve, which serves as the primary sensory pathway for both hearing and balance.

Final Answer:

Answer: (A)

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Q11.

Solution**Concept:**

Microscopical evaluation uses cellular arrangements to identify crude drugs and detect botanical adulteration. Stomatal complexes are categorized into diagnostic sub-types based on the orientation, size, and number of subsidiary cells surrounding the central guard cells.

Solution:

Step 1: Define the structural characteristics of paracytic stomata. Paracytic (or parallel-celled) stomata feature one or more subsidiary cells on each side of the guard cells, oriented parallel to the stomatal pore axis.

Step 2: Screen the diagnostic features of the listed crude drugs. Digitalis species possess anomocytic (irregular) stomata, while Datura features anisocytic (unequal-celled) stomatal structures.

Step 3: Analyze the anatomy of Senna (*Cassia angustifolia*). Microscopic examination of senna leaflets reveals prominent paracytic stomata alongside unicellular, warty trichomes.

Step 4: Review remaining botanical profiles. Peppermint leaves generally exhibit diacytic (cross-celled) stomatal formations, where the subsidiary cells lie perpendicular to the guard cells.

Step 5: Pair the drug with its cellular marker. The presence of parallel subsidiary cells confirms a paracytic arrangement, which serves as a key microscopical marker for identifying senna leaves.

Final Answer:

Answer: (A)

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Q12.

Solution**Concept:**

Phytochemical screening relies on colorimetric reactions to identify active chemical classes in crude drug extracts. Cardiac glycosides contain a steroid nucleus, an attached β -unsaturated lactone ring, and unique deoxy sugar moieties that can be detected via targeted chemical oxidation.

Solution:

Step 1: Identify the focus of the chemical test. The question asks for a diagnostic test that specifically detects the 2,6-deoxysugar components (such as digitoxose) found in cardiac glycosides.

Step 2: Analyze the mechanism of the Keller-Kiliani test. The crude sample is dissolved in glacial acetic acid containing trace amounts of ferric chloride, followed by the careful addition of concentrated sulfuric acid.

Step 3: Observe the color changes. A positive reaction produces a reddish-brown ring at the acid interface, while the upper acetic acid layer gradually turns a characteristic bluish-green color as the deoxy sugars oxidize.

Step 4: Compare with alternative options. Legal's, Baljet's, and Raymond's tests utilize alkaline nitroprusside or aromatic nitro compounds to target the unsaturated lactone ring, not the sugar chain.

Final Answer:

Answer: (A)

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Q13.

Solution**Concept:**

Pharmaceutical calculations for compounding and dilution follow the principle of conservation of mass. When diluting a concentrated stock solution with a pure solvent, the total amount of active solute remains constant, allowing calculations via proportional ratios.

Solution:

Step 1: State the fundamental dilution equation linking concentration (C) and volume (V):

$$C_1 \times V_1 = C_2 \times V_2$$

Step 2: Identify the given values from the problem statement:

$$\text{Stock Concentration } (C_1) = 10\% \text{ w/v}$$

$$\text{Target Volume } (V_2) = 500 \text{ mL}$$

$$\text{Target Concentration } (C_2) = 2\% \text{ w/v}$$

Step 3: Rearrange the dilution equation to isolate the unknown stock volume (V_1):

$$V_1 = \frac{C_2 \times V_2}{C_1}$$

Step 4: Substitute the values into the equation to calculate the volume:

$$V_1 = \frac{2 \times 500}{10}$$

$$V_1 = \frac{1000}{10} = 100 \text{ mL}$$

Step 5: Verify the mass of the solute. A 500 mL volume of a 2% w/v solution contains 10 g of solute, which matches the mass contained in 100 mL of a 10% stock solution.

Final Answer:

Answer: (A)

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Q14.

Solution**Concept:**

Endocrine disorders typically stem from hypersecretion, hyposecretion, or receptor insensitivity within hormone signaling pathways. These conditions cause systemic metabolic changes due to altered circulating hormone levels.

Solution:

Step 1: Define the clinical etiology of Grave's disease. Grave's disease is an autoimmune disorder driven by thyroid-stimulating immunoglobulins (TSI) that bind to and activate TSH receptors.

Step 2: Trace the endocrine outcome. This continuous receptor activation bypasses normal negative feedback loops, stimulating the thyroid gland to overproduce and secrete thyroxine (T_4) and triiodothyronine (T_3).

Step 3: Review systemic symptoms. High levels of thyroid hormones cause hyperthyroidism, which manifests as an elevated basal metabolic rate, weight loss, heat intolerance, tachycardia, and exophthalmos.

Step 4: Evaluate alternative choices. Excessive cortisol secretion causes Cushing's syndrome, insulin changes alter glucose regulation, and growth hormone excess leads to acromegaly or gigantism.

Final Answer:

Answer: (A)

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Q15.

Solution**Concept:**

Hepatic drug metabolism is divided into Phase I functionalization and Phase II conjugation pathways. These sequential biotransformations convert lipophilic xenobiotics into polar, water-soluble metabolites that can be cleared by the kidneys.

Solution:

Step 1: Define Phase I biotransformation. Phase I reactions introduce or expose polar functional groups (such as $-OH$, $-NH_2$, or $-COOH$) on a drug molecule via oxidation, reduction, or hydrolysis.

Step 2: Identify the enzymes involved. These modifications are primarily carried out by the cytochrome P450 monooxygenase enzyme superfamily located in the smooth endoplasmic reticulum.

Step 3: Analyze aromatic hydroxylation. This pathway introduces a hydroxyl group directly onto an aromatic ring system, making it a classic example of a Phase I oxidative reaction.

Step 4: Contrast with Phase II reactions. Glucuronidation, sulfate conjugation, and acetylation are Phase II conjugation processes where an endogenous polar molecule is covalently bound to a functional group.

Final Answer: Aromatic hydroxylation

Answer: (A)

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Q16.

Solution**Concept:**

Qualitative clinical biochemistry uses specific chemical reagents to identify biomolecules based on their characteristic functional groups. These screening tests detect structural elements like glycosidic, peptide, or ester linkages.

Solution:

Step 1: Identify the components of Molisch's reagent. This reagent consists of α -naphthol dissolved in ethanol, used alongside concentrated sulfuric acid as a dehydrating agent.

Step 2: Analyze the chemical reaction steps. When carbohydrates are exposed to concentrated mineral acids, they undergo dehydration to form furfural derivatives (from pentoses) or hydroxymethylfurfural derivatives (from hexes).

Step 3: Observe the condensation step. The generated furfural derivative reacts with α -naphthol at the liquid interface, producing a characteristic purple or violet ring.

Step 4: Determine test specificity. Because this dehydration-condensation pathway occurs with monosaccharides, disaccharides, and polysaccharides, Molisch's test serves as a general screen for all carbohydrates.

Final Answer: Reducing and non-reducing carbohydrates

Answer: (A)

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Q17.

Solution**Concept:**

National Health Programs are strategic public health initiatives designed to lower morbidity and mortality rates across targeted demographics. These programs improve healthcare equity by removing financial barriers to essential medical services at public facilities.

Solution:

Step 1: Identify the core initiative. The Janani Shishu Suraksha Karyakram (JSSK) was launched under the National Health Mission to improve maternal and neonatal health outcomes.

Step 2: Determine the target population. The program focuses on pregnant women and sick neonates utilizing public healthcare facilities for delivery and postnatal care.

Step 3: Outline the financial provisions. JSSK establishes an entitlement-based framework that guarantees completely free, cashless deliveries, eliminating out-of-pocket expenses for drugs, diagnostics, blood, and transport.

Step 4: Evaluate remaining options. While nutritional blindness and family planning are addressed by other initiatives, JSSK specifically targets healthcare costs related to childbirth.

Final Answer:

Guarantee completely free and cashless deliveries to pregnant women in public health institutions

Answer: (A)

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Q18.

Solution**Concept:**

Pharmaceutical packaging materials must maintain chemical neutrality, mechanical strength, and structural integrity during sterilization and long-term storage. Containers must not react with, leach components into, or adsorb molecules from liquid formulations.

Solution:

Step 1: Evaluate the requirements for parenteral packaging. Injectable solutions must be stored in unreactive containers that can withstand autoclaving without leaching alkali metals or organic plasticizers.

Step 2: Analyze Type I glass properties. Type I borosilicate glass contains significant amounts of boric oxide, which provides high chemical durability, thermal shock resistance, and minimal hydrolytic leaching.

Step 3: Compare with plastic containers. Flexible plastics like polyvinyl chloride (PVC) contain plasticizers (such as DEHP) that can leach into liquid formulations, potentially degrading sensitive active ingredients.

Step 4: Select the standard container material. Type I borosilicate glass is the regulatory standard for packaging highly sensitive parenterals, providing long-term chemical stability.

Final Answer: Type I Borosilicate glass

Answer: (A)

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Q19.

Solution**Concept:**

Autonomic pharmacology classifies drugs based on their affinity and selectivity for specific adrenergic receptor sub-types (α_1 , α_2 , β_1 , β_2). Receptor selectivity minimizes side effects by confining drug action to targeted physiological systems.

Solution:

Step 1: Identify the physiological goal. Managing chronic hypertension often involves reducing cardiac output and renin secretion, both of which are mediated by β_1 -adrenergic receptors located primarily in the heart and kidneys.

Step 2: Analyze the receptor profile of Metoprolol. Metoprolol is a cardioselective β_1 -adrenergic antagonist that reduces heart rate and myocardial contractility with minimal effect on bronchial β_2 receptors.

Step 3: Contrast with non-selective agents. Propranolol blocks both β_1 and β_2 receptors, which can cause bronchoconstriction in susceptible patients, making cardioselective options like metoprolol safer for general use.

Step 4: Rule out alternate classes. Salbutamol is a selective β_2 agonist used as a bronchodilator, whereas Prazosin is an α_1 -selective blocker, leaving Metoprolol as the matching β_1 antagonist.

Final Answer: Metoprolol

Answer: (A)

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Q20.

Solution**Concept:**

Organic reaction mechanisms are driven by the structural stability, hybridization, and geometry of reactive carbon intermediates. The spatial orientation of bonding pairs and vacant orbitals determines how these intermediates react with nucleophiles or electrophiles.

Solution:

Step 1: Analyze the structural properties of a carbocation. A carbocation is a trivalent carbon species carrying a formal positive charge and surrounded by six valence electrons.

Step 2: Determine the hybridization state. The central carbon atom utilizes sp^2 hybridization to form three covalent σ -bonds with neighboring groups.

Step 3: Define the molecular geometry. The sp^2 hybridized orbitals arrange themselves in a trigonal planar configuration with 120° bond angles to minimize electron-pair repulsion.

Step 4: Locate the remaining orbital. The unhybridized p -orbital remains vacant and projects perpendicularly above and below the plane of the σ -bonds.

Step 5: Contrast with other intermediates. Carbanions typically assume a pyramidal geometry with sp^3 hybridization due to their unshared electron pair, making carbocations the intermediate that matches the description.

Final Answer:

Answer: (A)

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Q21.

Solution**Concept:**

Nutritional hematology links dietary micronutrients to the biochemical pathways of erythrocyte maturation. Certain vitamins function as coenzymes required for nucleotide synthesis, and their absence disrupts normal cellular division in bone marrow.

Solution:

Step 1: Define megaloblastic anemia. This hematological condition is characterized by large, immature, dysfunctional red blood cells (megaloblasts) resulting from impaired DNA synthesis during erythropoiesis.

Step 2: Identify the metabolic role of Cyanocobalamin (Vitamin B₁₂). Vitamin B₁₂ serves as an essential cofactor for methionine synthase, an enzyme required for the folate-dependent synthesis of thymidine nucleotides.

Step 3: Analyze the effect of a deficiency. When Vitamin B₁₂ levels drop, folate becomes trapped in an unusable form, halting DNA replication while cytoplasmic growth continues, leading to megaloblast formation.

Step 4: Screen alternative options. Thiamine deficiency causes beriberi, riboflavin deficiency leads to ariboflavinosis, and ascorbic acid deficiency causes scurvy, making cyanocobalamin the correct causative factor.

Final Answer:

Answer: (A)

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Q22.

Solution**Concept:**

The statutory enforcement of pharmaceutical education and practice standards in India is governed by provisions in the Pharmacy Act 1948. This act establishes national administrative bodies tasked with maintaining standard curricula across institutions.

Solution:

Step 1: Identify the main goal of the Pharmacy Council of India (PCI). The PCI is the statutory body constituted under Section 3 of the Pharmacy Act 1948 to regulate the profession and education of pharmacy nationwide.

Step 2: Define its primary regulatory powers. Section 10 of the Act authorizes the PCI to frame the Education Regulations, which set the minimum standards of education required for registration as a pharmacist.

Step 3: Differentiate from other regulatory organizations. The CDSCO handles drug approvals, clinical trials, and manufacturing standards, while the AICTE oversees broader technical education but does not set professional registration criteria.

Step 4: Confirm the specific statutory role. The Pharmacy Council of India (PCI) is the authority responsible for prescribing registration requirements for pharmacists in India.

Final Answer: Pharmacy Council of India (PCI)

Answer: (A)

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Q23.

Solution**Concept:**

The unit operation of mechanical size reduction relies on physical forces like impact, attrition, compression, or shear. In a tumbling ball mill, particle reduction depends on the motion pattern of the grinding media within the rotating cylinder.

Solution:

Step 1: Analyze the mechanics of a ball mill. The mill consists of a hollow rotating cylinder loaded with metallic or ceramic spheres that grind material through a combination of impact and attrition.

Step 2: Examine operation at low rotational speeds. At slow speeds, the grinding balls roll over each other at the bottom of the mill, reducing particle sizes primarily through lower-energy attrition.

Step 3: Examine operation at the optimal speed. At the correct operating speed, the balls are carried up near the top of the cylinder before cascading downward, maximizing higher-energy impact forces.

Step 4: Analyze operation above the critical speed. When the rotation speed exceeds the critical threshold, centrifugal forces exceed gravitational pull, pinning the balls against the inner cylinder wall where they spin without falling.

Step 5: Determine the resulting effect. This centrifuging action prevents the grinding media from cascading, halting effective size reduction and causing the components to spin as a single unit.

Final Answer: Centrifuging action where balls cling to the inner wall

Answer: (A)

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Q24.

Solution**Concept:**

Clinical toxicology relies on specific antidotes to reverse drug toxicity by neutralizing, binding, or blocking active substances. These therapies use chemical or physiological mechanisms to counteract toxic drug levels in systemic circulation.

Solution:

Step 1: Identify the drug causing toxicity. Heparin is an injectable anticoagulant that carries a strong negative charge due to its highly sulfated glycosaminoglycan structure.

Step 2: Understand the chemical properties of the antidote. Protamine sulfate is a low-molecular-weight protein derived from fish sperm that contains high amounts of arginine, giving it a strong positive charge.

Step 3: Analyze the neutralization mechanism. When injected intravenously, the positively charged protamine molecules bind ionically to the negatively charged heparin molecules, forming a stable, inactive salt complex.

Step 4: Observe the therapeutic outcome. This ionic bonding neutralizes heparin's anticoagulant activity, safely clearing the complex from circulation to reverse the overdose.

Step 5: Review alternative choices. Vitamin K₁ reverses warfarin toxicity, aminocaproic acid treats fibrinolytic bleeding, and deferoxamine is used for iron poisoning, leaving protamine sulfate as the correct antidote.

Final Answer:

Answer: (A)

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Q25.

Solution**Concept:**

Metabolic pathways are regulated by rate-limiting enzymes that control the speed of downstream biochemical transformations. These regulatory steps respond to feedback loops and hormonal signals to maintain cellular homeostasis.

Solution:

Step 1: Trace the biosynthetic pathway of cholesterol. The multi-step pathway begins with acetyl-CoA, which goes through structural condensations to form the intermediate 3-hydroxy-3-methylglutaryl-coenzyme A (HMG-CoA).

Step 2: Identify the primary regulatory step. HMG-CoA reductase is an integral membrane protein located in the smooth endoplasmic reticulum that catalyzes the four-electron reduction of HMG-CoA into mevalonate.

Step 3: Analyze the thermodynamics. This enzymatic reduction is irreversible under physiological conditions, making it the primary rate-limiting step committed to downstream sterol production.

Step 4: Correlate with therapeutic targeting. Because of its central regulatory role, this enzyme is targeted by statin drugs to inhibit cholesterol production and manage hypercholesterolemia.

Final Answer: HMG-CoA reductase

Answer: (A)

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Q26.

Solution**Concept:**

The gastric mucosa contains specialized secretory cells that manage both chemical digestion and the absorption of essential micronutrients. These cells respond to hormonal, neural, and paracrine signals to release specific secretions into the stomach lumen.

Solution:

Step 1: Analyze the physiological role of parietal (oxyntic) cells. Located primarily in the gastric glands of the fundus and body of the stomach, these highly specialized cells secrete both hydrochloric acid (HCl) and intrinsic factor.

Step 2: Define the role of intrinsic factor. Intrinsic factor is a glycoprotein that binds dietary Vitamin B₁₂ in the small intestine, forming a complex required for receptor-mediated endocytosis in the terminal ileum.

Step 3: Evaluate alternative gastric cells. Chief cells secrete pepsinogen, G-cells produce the hormone gastrin, and mucous neck cells release protective mucus, leaving parietal cells as the source of intrinsic factor.

Step 4: Confirm clinical relevance. Damage to parietal cells can lead to a deficiency in intrinsic factor, which reduces Vitamin B₁₂ absorption and can cause pernicious megaloblastic anemia.

Final Answer: Parietal cells

Answer: (A)

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Q27.

Solution**Concept:**

Pharmacognosy classifies crude drugs based on their biological origins, including botanical or fungal sources. Ergot is an example of a fungal parasite that replaces the ovarian tissue of host plants with a dense, dormant structures rich in alkaloids.

Solution:

Step 1: Identify the organism. Ergot is a crude drug obtained from the dried sclerotium of the fungus *Claviceps purpurea*, which belongs to the family Clavicipitaceae.

Step 2: Determine the host plant association. This parasitic fungus primarily infects cereal crops, particularly rye grass, during the flowering stage when the fungal spores enter the open plant ovaries.

Step 3: Match the botanical nomenclature. The scientific name for cultivated rye grass is *Secale cereale*, which belongs to the Poaceae family.

Step 4: Exclude alternative plants. *Digitalis lanata* yields cardiac glycosides, *Papaver somniferum* produces opium latex, and *Atropa belladonna* yields tropane alkaloids, leaving rye grass as the primary host.

Final Answer:

Answer: (A)

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Q28.

Solution**Concept:**

The Narcotic Drugs and Psychotropic Substances (NDPS) Act 1985 establishes regulatory controls over the cultivation, production, manufacture, possession, and sale of habit-forming substances to prevent misuse while ensuring availability for medical use.

Solution:

Step 1: Analyze the division of regulatory powers. The NDPS Act divides administrative authority between the Central Government and State Governments depending on the specific substance and its production stage.

Step 2: Evaluate the regulations for opium poppy cultivation. Because opium contains potent alkaloids like morphine and codeine, its cultivation is under tight national oversight to prevent illicit diversion.

Step 3: Identify the authorized governing body. The Central Government holds the exclusive statutory authority to license, supervise, and define the geographical areas permitted for cultivating the opium poppy (*Papaver somniferum*).

Step 4: Differentiate from other choices. While State Governments manage retail licensing for certain psychotropic derivatives, the Central Government maintains direct control over the agricultural cultivation of opium.

Final Answer: Central Government

Answer: (A)

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Q29.

Solution**Concept:**

Patient counseling strategies ensure that medications are administered correctly to optimize therapeutic efficacy and prevent improper use. Instructing patients on appropriate administration routes is essential for drugs that undergo significant first-pass hepatic metabolism.

Solution:

Step 1: Analyze the pharmacokinetics of nitroglycerin. When swallowed orally, nitroglycerin undergoes rapid and extensive first-pass hepatic metabolism via glutathione reductase, reducing its systemic bioavailability to less than 1%.

Step 2: Understand the sublingual administration route. Placing the tablet under the tongue allows the active drug to dissolve quickly and absorb directly through the oral mucosa into the systemic venous circulation.

Step 3: Evaluate the clinical benefits. This route bypasses liver metabolism, providing rapid therapeutic onset within 1 to 3 minutes to relieve acute anginal chest pain.

Step 4: Formulate the proper clinical advice. Patients must be instructed to place the tablet under the tongue and allow it to dissolve completely without chewing or swallowing it, ensuring direct mucosal absorption.

Final Answer:

Explaining that the tablet must be kept under the tongue and allowed to dissolve without swallowing

Answer: (A)

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Q30.

Solution**Concept:**

Aminoglycoside antibiotics are bactericidal agents that selectively target structural components of bacterial protein synthesis machinery, disrupting translation and leading to cell death.

Solution:

Step 1: Identify the drug class. Gentamicin belongs to the aminoglycoside family, which consists of highly polar, water-soluble amino sugars linked via glycosidic bonds.

Step 2: Locate the subcellular target site. Once inside the bacterial cell via oxygen-dependent active transport, Gentamicin binds irreversibly to specific protein receptors on the 30S ribosomal subunit.

Step 3: Analyze the functional outcome. This binding alters the structural conformation of the A-site on the ribosome, causing misreading of the mRNA genetic code during translation.

Step 4: Trace the bactericidal effect. The misread mRNA leads to the synthesis of abnormal, non-functional proteins that insert into the bacterial cell membrane, disrupting its integrity and causing cell lysis.

Final Answer:

Binding to the 30S ribosomal subunit causing misreading of mRNA

Answer: (A)

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Q31.

Solution**Concept:**

Diagnostic serology relies on specific antigen-antibody agglutination or precipitation reactions to detect infectious pathogens in clinical blood or serum samples.

Solution:

Step 1: Identify the pathogen. Enteric fever, commonly known as typhoid fever, is a systemic infection caused by the Gram-negative bacterium *Salmonella enterica* serovar Typhi.

Step 2: Evaluate the mechanism of the Widal test. The Widal test is a serological agglutination assay that detects antibodies present in the patient's serum directed against the somatic (O) and flagellar (H) antigens of the typhoid bacilli.

Step 3: Analyze alternative diagnostic options. The Schick and Dick tests evaluate susceptibility to diphtheria and scarlet fever toxins, respectively, while the Weil-Felix test uses cross-reacting *Proteus* antigens to detect rickettsial infections.

Step 4: Confirm standard clinical use. The Widal test remains a widely utilized serological method for diagnosing enteric typhoid infections, particularly in resource-limited clinical settings.

Final Answer:

Answer: (A)

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Q32.

Solution**Concept:**

Prescription writing routinely incorporates traditional Latin terms, abbreviations, and symbols to communicate dosing schedules, frequencies, and administration instructions. Interpreting these abbreviations correctly is essential for preventing medication dispensing errors.

Solution:

Step 1: Identify the abbreviation of interest. The Latin phrase "ter in die" is commonly abbreviated as "t.i.d." or "tid" within the signa section of a prescription.

Step 2: Translate the term literal components. "Ter" translates directly to "three times," "in" means "in," and "die" translates to "day."

Step 3: Combine into standard medical language. The full phrase translates to a dosing frequency of "three times a day" (e.g., morning, afternoon, and evening).

Step 4: Differentiate from other common frequencies. "Semel in die" (q.d.) means once daily, "bis in die" (b.i.d.) means twice daily, and "quater in die" (q.i.d.) translates to four times daily.

Final Answer: Three times a day

Answer: (A)

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Q33.

Solution**Concept:**

The cardiac conduction system consists of specialized myocardial cells that generate and propagate electrical impulses rhythmically. This automaticity coordinates the sequential contraction of the atria and ventricles to maintain systemic circulation.

Solution:

Step 1: Define automaticity in cardiac tissue. Various structures in the heart can spontaneously depolarize, but the structure with the highest intrinsic frequency dominates the overall cardiac rhythm.

Step 2: Identify the sinoatrial (SA) node location. The SA node is a cluster of specialized pacemaker cells located in the superior wall of the right atrium, near the opening of the superior vena cava.

Step 3: Analyze the depolarization rate. The SA node generates action potentials at an intrinsic rate of 60 to 100 impulses per minute, faster than the AV node (40–60) or Purkinje fibers (15–40).

Step 4: Define its clinical function. Because it possesses the fastest inherent rate, the SA node suppresses downstream pacemakers and sets the sinus rhythm, serving as the primary pacemaker of the heart.

Final Answer: Sinoatrial (SA) node

Answer: (A)

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Q34.

Solution**Concept:**

Chemical stability in pharmaceutical formulations depends on the susceptibility of specific functional groups to environmental degradation pathways. Esters, amides, and lactams are often vulnerable to moisture-driven cleavage when exposed to aqueous or humid environments.

Solution:

Step 1: Identify the chemical structure of aspirin. Aspirin, or acetylsalicylic acid, contains an ester linkage formed by the acetylation of the phenolic hydroxyl group of salicylic acid.

Step 2: Analyze the degradation pathway in humid conditions. When exposed to water or atmospheric moisture, the ester linkage undergoes nucleophilic attack by water molecules.

Step 3: Trace the chemical products. This hydrolytic cleavage breaks the ester bond, splitting the molecule into salicylic acid and acetic acid, which can give degraded aspirin a characteristic vinegar-like odor.

Step 4: Conclude the primary mechanism. Hydrolysis is the primary chemical degradation pathway for aspirin, and it can be minimized by utilizing moisture-resistant packaging and dry formulation environments.

Final Answer: Hydrolytic cleavage

Answer: (A)

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Q35.

Solution**Concept:**

Chronic heavy metal poisoning alters cellular enzymes and disrupts metabolic pathways. Lead binds to sulfhydryl groups on functional proteins, interfering with heme biosynthesis and causing characteristic cellular abnormalities in bone marrow.

Solution:

Step 1: Define the systemic impact of chronic lead exposure (Plumbism). Lead disrupts heme synthesis by inhibiting key enzymes, including ferrochelatase and δ -aminolevulinic acid dehydratase (ALAD).

Step 2: Analyze the hematological consequences. This enzymatic inhibition leads to incomplete heme production and causes ribosomal RNA to aggregate within developing red blood cells.

Step 3: Identify the microscopic marker. Under standard blood smear examination, these abnormal RNA aggregates appear as dark blue granules scattered across the erythrocyte cytoplasm, a feature known as basophilic stippling.

Step 4: Differentiate from other heavy metal toxicities. Minamata disease is caused by methylmercury poisoning, while argyria results from chronic silver deposition, making basophilic stippling a specific marker for lead toxicity.

Final Answer: Basophilic stippling of erythrocytes

Answer: (A)

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Q36.

Solution**Concept:**

Vaccine administration routes are chosen based on the formulation properties and the desired immune response. Different routes, such as intradermal, subcutaneous, or intramuscular injections, target specific tissue layers to optimize antigen processing by immune cells.

Solution:

Step 1: Identify the vaccine type. The Bacillus Calmette-Guérin (BCG) vaccine is a live-attenuated preparation of *Mycobacterium bovis* used to protect against severe forms of tuberculosis, such as tuberculous meningitis.

Step 2: Locate the required anatomical layer. The BCG vaccine must be delivered directly into the dermis layer of the skin, just below the epidermis.

Step 3: Analyze the administration technique. The injection is given in the deltoid region using a short needle inserted at a shallow angle (10° – 15°), which creates a temporary wheal or bleb in the skin.

Step 4: Understand the immunological rationale. The intradermal layer contains a high density of antigen-presenting dendritic cells (Langerhans cells), which help stimulate a localized cell-mediated immune response.

Final Answer:

Answer: (A)

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Q37.

Solution**Concept:**

Crude drug evaluation confirms identity, purity, and quality through specific categories of testing: morphological, physical, chemical, and biological assays. Each category measures different properties of the raw botanical material.

Solution:

Step 1: Define physical evaluation in pharmacognosy. Physical evaluation involves measuring specific physical constants of a crude drug substance using standardized analytical instruments.

Step 2: Analyze the parameters mentioned. Refractive index measures the bending of light through a liquid substance, while optical rotation measures the rotation of plane-polarized light by chiral molecules.

Step 3: Apply to specific drug matrices. These physical constants are highly specific markers used to verify the purity of volatile oils, fixed oils, and oleoresins.

Step 4: Exclude alternative evaluation categories. Chemical evaluation uses color reactions or assays, morphological evaluation relies on sensory characteristics, and physical evaluation focuses on constants like melting points, solubility, and optical properties.

Final Answer: Physical evaluation

Answer: (A)

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Q38.

Solution**Concept:**

A hospital formulary system is an operational and clinical framework managed by the Pharmacy and Therapeutics Committee (PTC). It optimizes patient care and hospital expenditure by establishing a selected list of medications approved for use in the institution.

Solution:

Step 1: Define the core purpose of a formulary list. A hospital formulary is a continually revised compilation of pharmaceuticals, consumables, and biological products that reflects the current clinical judgment of the medical staff.

Step 2: Identify the selection criteria. Medications are chosen based on objective evidence regarding their comparative efficacy, safety profiles, bioequivalence, and cost-effectiveness.

Step 3: Understand the operational benefits. Maintaining a closed formulary helps reduce inventory duplication, simplifies procurement, lowers holding costs, and encourages evidence-based prescribing practices within the hospital.

Final Answer:

To provide an updated list of preferred, clinically evaluated medications available in the facility

Answer: (A)[Go Back to Question 38](#)

Q39.

Solution**Concept:**

Phytochemical structures are categorized into distinct secondary metabolite classes based on their core carbon-nitrogen ring skeletons. These core geometries dictate both the biosynthetic pathways and the pharmacological profiles of the molecules.

Solution:

Step 1: Analyze the origin of atropine. Atropine is an optically inactive racemic mixture of d- and l-hyoscyamine, isolated from solanaceous plants like *Atropa belladonna* or *Datura stramonium*.

Step 2: Examine the core chemical ring structure. The atropine molecule features a fused bicyclic nitrogenous skeleton composed of a pyrrolidine ring and a piperidine ring sharing common atoms.

Step 3: Identify the technical class name. This specific fused bicyclic core ring system is classified as a tropane nucleus. Atropine is an ester formed by the combination of tropine (an alcohol) and tropic acid.

Step 4: Distinguish from alternative alkaloid groups. Quinoline core rings are found in cinchona, isoquinolines in opium, and indoles in ergot, confirming that atropine belongs to the tropane alkaloid class.

Final Answer: Tropane alkaloid

Answer: (A)

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Q40.

Solution**Concept:**

Isotonic calculations ensure that parenteral and ophthalmic formulations match the osmotic pressure of body fluids, such as blood plasma or lacrimal fluid. An isotonic solution prevents fluid shifts across biological cell membranes, minimizing tissue damage and pain during administration.

Solution:

Step 1: Identify the target concentration for tonicity. Human blood plasma and lacrimal fluid exhibit an osmotic pressure equivalent to an aqueous solution containing 0.9% *w/v* of sodium chloride (NaCl).

Step 2: Define the percentage concentration expression (*w/v*). A 0.9% *w/v* solution indicates that there are exactly 0.9 grams of solute dissolved in every 100 milliliters of total solution volume.

Step 3: Identify the required target volume. The problem asks for the mass of sodium chloride needed to prepare exactly 100 mL of this isotonic solution.

Step 4: Calculate the required mass. Using the concentration definition:

$$\text{Mass of NaCl} = \frac{0.9 \text{ g}}{100 \text{ mL}} \times 100 \text{ mL} = 0.9 \text{ grams}$$

Final Answer:

Answer: (A)

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Q41.

Solution**Concept:**

Inorganic antacids neutralize excess gastric hydrochloric acid to relieve symptoms of acid indigestion and peptic ulcers. These agents are classified as systemic or non-systemic based on their solubility and absorption profile in the gastrointestinal tract.

Solution:

Step 1: Analyze the properties of systemic antacids. Systemic antacids are soluble in water, readily absorbed from the gastrointestinal lumen into the bloodstream, and can alter systemic acid-base balance.

Step 2: Examine the reactivity of sodium bicarbonate (NaHCO_3). Sodium bicarbonate is a highly soluble inorganic compound that rapidly neutralizes gastric acid, releasing carbon dioxide gas.

Step 3: Trace the metabolic consequence. Because unreacted sodium ions and bicarbonate ions are easily absorbed across the intestinal mucosa, excessive or prolonged use can elevate plasma bicarbonate levels, leading to systemic metabolic alkalosis.

Step 4: Compare with non-systemic alternatives. Aluminum, magnesium, and calcium antacids form insoluble salts in the intestine that are mostly excreted, minimizing their impact on systemic pH.

Final Answer: Sodium bicarbonate

Answer: (A)

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Q42.

Solution**Concept:**

Organic chemical reactions involve interactions between electron-rich species and electron-deficient species. Understanding the electronic properties, formal charges, and orbital states of these reagents helps predict reaction pathways and outcomes.

Solution:

Step 1: Define the etymology and meaning of the term. The word "electrophile" translates to "electron-loving," indicating a chemical species that seeks out regions of high electron density.

Step 2: Analyze the electronic configuration of an electrophile. Electrophiles are atoms or molecules that possess an electron-deficient center, often characterized by a vacant valence orbital or a partial positive charge.

Step 3: Determine its chemical reactivity. Because it lacks a complete octet or stable valence shell, an electrophile acts as a Lewis acid, accepting an electron pair from a nucleophile to form a new covalent σ -bond.

Step 4: Contrast with nucleophiles. Nucleophiles are electron-rich species with unshared electron pairs that donate density, confirming that electrophiles are characterized by an electron-deficient state.

Final Answer:

An electron-deficient atom capable of accepting an electron pair

Answer: (A)

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Q43.

Solution**Concept:**

Antihyperlipidemic agents regulate plasma lipid profiles by modifying endogenous biosynthetic pathways or clearance mechanisms. Lowering specific atherogenic lipoprotein fractions helps slow the progression of cardiovascular disease.

Solution:

Step 1: Identify the mechanism of action of statins. Statins (such as atorvastatin or simvastatin) are competitive inhibitors of HMG-CoA reductase, the rate-limiting enzyme in hepatic cholesterol synthesis.

Step 2: Trace the cellular feedback loop. The reduction in intracellular cholesterol levels prompts hepatocytes to upregulate the expression of surface LDL receptors.

Step 3: Analyze the clearance of lipoproteins. These increased receptors enhance the clearance of circulating low-density lipoprotein (LDL) cholesterol from the bloodstream into the liver.

Step 4: Identify the primary clinical target. Because LDL cholesterol is a primary biomarker associated with atherosclerosis, statins are primarily used to lower plasma LDL levels.

Final Answer:

Low-density lipoprotein (LDL) cholesterol via HMG-CoA reductase inhibition

Answer: (A)

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Q44.

Solution**Concept:**

Pharmaceutical laws classify drugs into specific schedules to govern their sale, dispensing, and safety oversight. Over-The-Counter (OTC) medicines can be safely purchased without a prescription, whereas prescription-only drugs require direct medical authorization.

Solution:

Step 1: Define OTC medications. Over-the-counter medicines are drugs approved for self-medication because they possess a high safety margin when used according to label instructions.

Step 2: Evaluate the properties of Paracetamol (Acetaminophen). Paracetamol is a widely used analgesic and antipyretic drug that is legally accessible as an OTC medication in many jurisdictions for managing mild pain and fever.

Step 3: Assess alternative choices. Amoxicillin (an antibiotic), Alprazolam (a benzodiazepine under Schedule X), and Metformin (an antidiabetic under Schedule H) all require a valid prescription due to safety and resistance risks.

Final Answer: Paracetamol tablets

Answer: (A)

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Q45.

Solution**Concept:**

Solute transport across biological cell membranes occurs via passive mechanisms or active carrier-mediated pathways. These transport modes are differentiated by their directional movement relative to electrochemical gradients and their use of cellular energy.

Solution:

Step 1: Define the passive transport mechanism. Passive diffusion involves molecules moving down their electrochemical or concentration gradient, from an area of higher concentration to lower concentration, without consuming cellular energy.

Step 2: Analyze active transport requirements. Active transport is a carrier-mediated process that moves solutes against their concentration gradient (from low concentration to high concentration).

Step 3: Identify the energy source. Moving molecules against a gradient requires thermodynamic work, which is driven by the hydrolysis of adenosine triphosphate (ATP).

Step 4: Differentiate from facilitated diffusion. While facilitated diffusion uses carrier proteins, it moves solutes down their concentration gradient and does not require ATP energy, confirming the distinctive nature of active transport.

Final Answer:

Proceeds against a concentration gradient and directly requires metabolic energy (ATP)

Answer: (A)

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Q46.

Solution**Concept:**

The anatomical structure of the human eye consists of concentric tissue layers that support, focus, and detect incoming light. The innermost sensory layer contains specialized neuroepithelial cells that convert electromagnetic radiation into neural signals.

Solution:

Step 1: Analyze the layers of the eye. The outer fibrous layer consists of the sclera and cornea, the middle vascular layer includes the choroid and ciliary body, and the innermost layer is the nervous tunic.

Step 2: Identify the sensory layer. The retina is the nervous tissue layer that lines the posterior segment of the eye.

Step 3: Describe the photoreceptor cells. The retina contains two main types of photoreceptors: rods, which handle vision in dim light, and cones, which manage color vision and high-acuity detail.

Step 4: Trace signal transduction. These photoreceptors absorb incoming photons and initiate a biochemical cascade that transmits nerve impulses along the optic nerve to the visual cortex.

Final Answer:

Answer: (A)

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Q47.

Solution**Concept:**

The Drugs and Cosmetics Rules 1945 incorporate statutory schedules that define labeling, prescribing, and dispensing standards for specific drug classes to ensure patient safety and regulatory compliance.

Solution:

Step 1: Identify the regulatory objective. The question seeks the specific schedule that governs the classification, labeling warnings, and dispensing conditions for prescription-only allopathic medications.

Step 2: Evaluate the scope of Schedule H. Schedule H contains a list of prescription drugs that legally cannot be sold by retail without a valid prescription written by a Registered Medical Practitioner (RMP).

Step 3: Review labeling mandates. Drugs under Schedule H must carry a prominent warning label, such as the symbol "Rx" on the top left corner and a box stating that the medicine is to be sold only with a prescription.

Step 4: Compare with other schedules. Schedule G covers drugs requiring medical supervision, Schedule X manages specific psychotropic substances, and Schedule P regulates drug shelf-life durations.

Final Answer:

Answer: (A)

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Q48.

Solution**Concept:**

The limit test for arsenic is a quantitative safety assay based on converting trace impurities into a volatile gas. This gas then reacts with an analytical test paper to generate a measurable color comparison against a standard.

Solution:

Step 1: Understand the setup of the arsenic limit test. The test utilizes a specialized glass apparatus (Gutzeit apparatus) where chemical reactions convert arsenic impurities into arsine gas.

Step 2: Identify the oxidation states. Arsenic impurities may be present in the sample as arsenic acid or arsenate (As^{5+}) ions, which must be reduced to complete the volatile conversion.

Step 3: Analyze the role of the reducing agents. Stannous chloride (SnCl_2) and potassium iodide (KI) are added to the acidic reaction mixture to reduce arsenic acid completely into arsenious acid (As^{3+}).

Step 4: Trace the subsequent steps. The resulting arsenious acid is reduced by nascent hydrogen (generated via a zinc-acid reaction) to form volatile arsine gas (AsH_3), which leaves the solution to react with mercuric chloride paper.

Final Answer: Reduce arsenic acid completely to arsenious acid

Answer: (A)

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Q49.

Solution**Concept:**

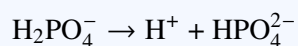
The Brønsted-Lowry acid-base theory defines an acid as a chemical species capable of donating a proton (H^+) and a base as a species that accepts a proton. Removing a proton from an acid yields its corresponding conjugate base.

Solution:

Step 1: Identify the starting chemical species. The problem specifies the dihydrogen phosphate ion, which carries the formula H_2PO_4^- .

Step 2: Apply the proton donation principle. To find the conjugate base of this amphiprotic ion, we simulate a reaction where it acts as a Brønsted-Lowry acid by losing one proton (H^+).

Step 3: Formulate the chemical equation for proton loss:



Step 4: Determine the charge and formula of the product. Removing a positive charge (H^+) from a net -1 ion yields a product with a -2 charge, which corresponds to the monohydrogen phosphate ion, HPO_4^{2-} .

Final Answer: HPO_4^{2-}

Answer: (A)

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Q50.

Solution**Concept:**

Nucleophilic substitution reactions (S_N1 and S_N2) are driven by the structural properties of the carbon substrate, the strength of the incoming nucleophile, and the stability of reaction intermediates.

Solution:

Step 1: Analyze the chemical substrate. The reaction features a tertiary alkyl halide, where the leaving group halogen is bound to a hindered carbon atom attached to three other carbon groups.

Step 2: Evaluate the steric environment. High steric hindrance around a tertiary carbon prevents an incoming nucleophile from mounting a direct backside attack, making a concerted S_N2 mechanism unfavorable.

Step 3: Trace the step-by-step pathway. Instead, the leaving group leaves spontaneously in a rate-limiting ionization step, generating a stable tertiary carbocation intermediate.

Step 4: Complete the substitution. The incoming hydroxide nucleophile then attacks the planar carbocation to form the final alcohol product. This two-step pathway is the classic S_N1 mechanism.

Final Answer:

Answer: (A)

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Q51.

Solution**Concept:**

The duration of action and metabolic inactivation of local anesthetics are determined by the chemical link that joins their lipophilic aromatic ring to their hydrophilic amine head group. This structural linkage divides local anesthetics into ester or amide classes, which are metabolized through different physiological pathways.

Solution:

Step 1: Identify the chemical class of procaine. Procaine contains a central ester linkage connecting its para-aminobenzoic acid ring to its diethylaminoethanol group, classifying it as an ester-type local anesthetic.

Step 2: Locate the primary site of metabolism for ester links. Unlike amide-linked anesthetics that undergo extensive hepatic biotransformation, ester-linked drugs are rapidly broken down directly within the circulatory system.

Step 3: Identify the specific enzyme involved. Human blood plasma contains high concentrations of pseudocholinesterase (also known as plasma cholinesterase or butyrylcholinesterase).

Step 4: Trace the chemical inactivation process. This enzyme rapidly hydrolyzes the ester linkage of procaine, splitting the molecule into para-aminobenzoic acid (PABA) and diethylaminoethanol, which effectively neutralizes its local anesthetic activity.

Final Answer: Hydrolysis via pseudocholinesterase

Answer: (A)

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Q52.

Solution**Concept:**

Clinical biochemical markers evaluate the functional status of specific organ systems. Serum biomarkers for renal clearance assess how effectively the kidneys filter waste products from the blood without significant reabsorption or secretion.

Solution:

Step 1: Define glomerular filtration rate (GFR). GFR measures the volume of fluid filtered by the kidney's glomerular capillaries per unit of time, serving as a key indicator of overall renal function.

Step 2: Evaluate creatinine as a metabolic marker. Creatinine is a breakdown product of creatine phosphate in muscle tissue, produced at a relatively constant rate by the body.

Step 3: Analyze the renal clearance pathway. Creatinine is freely filtered by the glomeruli and undergoes minimal tubular secretion or reabsorption, making its clearance rate a close approximation of actual GFR.

Step 4: Assess alternative diagnostic choices. Serum bilirubin, alanine aminotransferase (ALT), and alkaline phosphatase (ALP) are clinical biomarkers used to evaluate hepatic function and biliary integrity, not renal status.

Final Answer: Serum Creatinine Clearance

Answer: (A)

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Q53.

Solution**Concept:**

Contraceptive methods rely on mechanical, hormonal, or chemical mechanisms to disrupt normal reproductive physiology. These methods act at different stages, such as preventing ovulation, thickening cervical mucus, or blocking blastocyst implantation.

Solution:

Step 1: Analyze the mechanism specified in the prompt. The method must act locally within the uterine cavity to create an inflammatory response that prevents a fertilized blastocyst from implanting.

Step 2: Examine the action of non-hormonal Intrauterine Devices (IUDs). A copper IUD acts as a local foreign body within the uterine lumen, stimulating an inflammatory response in the endometrium.

Step 3: Understand the biochemical effects. This sterile inflammatory reaction increases cellular infiltrates and releases cytotoxic cytokines that are toxic to spermatozoa and alter the endometrial lining, preventing blastocyst implantation.

Step 4: Differentiate from alternative contraceptive classes. Oral combined pills and subcutaneous implants prevent ovulation via systemic hormonal feedback, while barrier diaphragms mechanically block sperm entry into the cervix.

Final Answer:

Answer: (A)

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Q54.

Solution**Concept:**

Tablet manufacturing can introduce physical structural defects due to formulation issues, improper moisture content, or mechanical faults during high-speed tableting compression. Identifying these defects helps maintain product quality.

Solution:

Step 1: Analyze the definition of capping. Capping is a structural tablet defect characterized by the partial or complete separation of the top or bottom crowns from the main body of the tablet.

Step 2: Understand the underlying mechanical causes. This separation is typically caused by air entrapment within the granule matrix during high-speed compression, which expands when the punch pressure is released.

Step 3: Differentiate from alternative compression defects. Lamination involves a tablet splitting into multiple horizontal layers, sticking refers to material adhering to the die wall, and mottling describes an unequal distribution of color.

Final Answer:

The partial or complete separation of the top or bottom crowns of a tablet from the main body

Answer: (A)[Go Back to Question 54](#)

Q55.

Solution**Concept:**

Compounding a stable primary emulsion via the dry gum or wet gum method requires an optimal ratio of oil, water, and emulsifying agent. This ratio varies depending on the chemical characteristics and viscosity of the internal oil phase.

Solution:

Step 1: Classify the oil specified in the compounding scenario. The problem isolates the specific preparation requirements for a primary emulsion formulated using a fixed oil (such as castor oil or almond oil).

Step 2: Recall the standard pharmacopoeial compounding proportions. For fixed oils, the required volumetric and weight distribution ratio for Oil : Water : Gum is traditionally established as 4 : 2 : 1.

Step 3: Contrast with alternative oil classes. Volatile essential oils require a 2 : 2 : 1 ratio, while mineral hydrocarbon oils typically require a 3 : 2 : 1 ratio due to their different surface properties.

Step 4: Confirm the specific calculation. A primary emulsion using a fixed oil requires 4 parts of oil, 2 parts of water, and 1 part of gum to yield a stable, homogeneous primary system.

Final Answer:

Answer: (A)

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Q56.

Solution**Concept:**

Systemic bioavailability (F) is the fraction of an administered drug dose that reaches the systemic circulation intact. It depends on the route of administration and the drug's ability to bypass absorptive and metabolic barriers.

Solution:

Step 1: Define the baseline parameter for maximum bioavailability. A drug has 100% systemic bioavailability ($F = 1$) when the entire administered dose enters the systemic bloodstream without loss.

Step 2: Analyze the intravenous route of administration. Intravenous injection delivers the drug solution directly into a systemic vein, bypassing the gastrointestinal epithelium, endothelial barriers, and first-pass hepatic metabolism.

Step 3: Compare with extravascular routes. Intramuscular, subcutaneous, and transdermal routes require the drug to diffuse across tissue layers into capillaries, a process that can be incomplete due to local absorption barriers or enzymatic degradation.

Final Answer:

Answer: (A)

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Q57.

Solution**Concept:**

Pediatric dosing calculations adjust adult drug doses based on a child's age or body weight to account for age-related differences in pharmacokinetics. Young's Rule calculates a pediatric dose based on the child's age in years.

Solution:

Step 1: State the mathematical formula for Young's Rule:

$$\text{Child Dose} = \frac{\text{Age in years}}{\text{Age in years} + 12} \times \text{Adult Dose}$$

Step 2: Identify the given parameters from the clinical scenario:

Age of the child = 6 years

Standard adult dose = 60 mg

Step 3: Substitute these values into the formula to calculate the child's dose:

$$\text{Child Dose} = \frac{6}{6 + 12} \times 60 \text{ mg}$$

Step 4: Simplify the fraction and calculate the final value:

$$\text{Child Dose} = \frac{6}{18} \times 60 = \frac{1}{3} \times 60 = 20 \text{ mg}$$

Final Answer: 20 mg

Answer: (A)

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Q58.

Solution**Concept:**

Pharmaceutical glass packaging is classified into four distinct compendial types based on chemical composition and resistance to water attack. Choosing the correct glass type ensures chemical stability during high-temperature thermal sterilization.

Solution:

Step 1: Analyze the requirements for high chemical resistance. Parenteral preparations, especially those requiring autoclaving, must be stored in glass that minimizes the leaching of alkali oxides into the solution.

Step 2: Evaluate Type I glass. Type I borosilicate glass contains significant amounts of boric oxide, which provides high hydrolytic resistance, a low thermal expansion coefficient, and minimal alkali leaching.

Step 3: Consider light protection. Adding amber colorants to Type I glass screens out ultraviolet radiation, protecting light-sensitive compounds from photodegradation.

Step 4: Compare with alternative options. Type II glass is treated soda-lime glass with surface resistance, Type III is regular soda-lime glass with moderate resistance, and NP is non-parenteral glass, making Type I the standard for sensitive injectables.

Final Answer: Type I Borosilicate Glass (Ambered)

Answer: (A)

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Q59.

Solution**Concept:**

Manufacturing highly purified water for injection (WFI) requires unit operations that remove dissolved solids, volatile contaminants, biological endotoxins, and microorganisms to meet pharmacopoeial purity standards.

Solution:

Step 1: Analyze the mechanism of multi-stage distillation systems. Distillation is a thermal separation process that relies on differences in volatility between water and its impurities.

Step 2: Trace the physical phase transitions. Input feedwater is heated to its boiling point, converting liquid water into pure water vapor while leaving non-volatile contaminants, pyrogens, and salts behind in the liquid residue.

Step 3: Analyze the recovery phase. The generated vapor travels through specialized entrainment separators into a condenser, where thermal energy is removed to turn the vapor back into liquid water for injection.

Step 4: Identify the primary operational principles. This purification process relies on heat transfer combined with vapor-liquid phase separation to remove non-volatile impurities.

Final Answer: Heat transfer combined with vapor-liquid phase separation

Answer: (A)

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Q60.

Solution**Concept:**

Pharmaceutical compounding incompatibilities are divided into physical, chemical, or therapeutic categories depending on the underlying mechanism. Chemical incompatibilities occur when chemical reactions between components form new, often unwanted substances.

Solution:

Step 1: Identify the reactive components in the prescription. The formulation combines soluble iron salts (such as ferric chloride) with tannic acid.

Step 2: Analyze the underlying chemical reaction. Ferric ions react with the phenolic hydroxyl groups of tannic acid, forming a ferric tannate coordination complex.

Step 3: Observe the physical manifestation. Ferric tannate is an insoluble complex that precipitates out of solution as a dark, ink-like dark blue or black substance.

Step 4: Classify the incompatibility. Because this visual change results from a chemical reaction that breaks and forms covalent or coordination bonds, it is classified as a chemical incompatibility.

Final Answer:

Answer: (A)

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Q61.

Solution**Concept:**

Inorganic pharmaceutical chemistry utilizes metal oxides, peroxides, and salts as topical protectives, astringents, and antimicrobial agents in dermatological preparations.

Solution:

Step 1: Analyze the composition of calamine lotion. Calamine is a powder containing zinc oxide (ZnO) blended with a small percentage (around 0.5%) of ferric oxide (Fe_2O_3), which gives it a characteristic pink color.

Step 2: Understand the pharmacological action of zinc oxide. Zinc oxide acts as a mild topical astringent, causing loose protein networks on damaged skin to cross-link and tighten.

Step 3: Evaluate its protective benefits. It forms a physical barrier on the skin surface that protects irritated tissue from external friction, moisture, and environmental irritants.

Step 4: Differentiate from alternative options. Barium sulfate serves as an oral radiopaque contrast agent, sodium thiosulfate treats cyanide poisoning, and selenium sulfide is used in anti-dandruff shampoos, leaving zinc oxide as the primary astringent component.

Final Answer:

Answer: (A)

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Q62.

Solution**Concept:**

Ophthalmic formulations must be carefully prepared to match the physiological properties of natural eye structures. Adjusting the tonicity and osmotic pressure of eye drops minimizes tissue irritation and discomfort during use.

Solution:

Step 1: Examine the properties of natural lacrimal fluid. Lacrimal fluid has an osmotic pressure equivalent to an aqueous solution containing 0.9% w/v of sodium chloride, with a strict balance of dissolved ions.

Step 2: Analyze the effect of non-isotonic instillations. Introducing a hypertonic or hypotonic solution creates an osmotic gradient across corneal epithelial cells, causing water to rapidly enter or leave the tissue.

Step 3: Correlate with patient symptoms. This rapid fluid shift stimulates local nociceptors, causing pain, ocular irritation, corneal cell swelling or shrinkage, and reflexive lacrimation that washes out the active drug.

Step 4: Identify the primary formulation goal. Matching the ionic strength and osmolarity to lacrimal fluid ensures that eye drops can be administered comfortably without causing ocular irritation, tissue damage, or excessive tearing.

Final Answer: To prevent ocular irritation, tissue damage, and lacrimation upon instillation

Answer: (A)

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Q63.

Solution**Concept:**

Structural isomerism occurs when chemical compounds share the same molecular formula but differ in the connectivity or arrangement of their atoms, resulting in different functional properties.

Solution:

Step 1: Identify the molecular formula of both monosaccharides. Both D-glucose and D-fructose share the identical molecular formula, $C_6H_{12}O_6$, indicating they are structural isomers.

Step 2: Examine the functional carbonyl placement in D-glucose. D-glucose features a carbonyl group located at the terminal C-1 position, classifying it as a polyhydroxy aldehyde (aldose).

Step 3: Examine the functional carbonyl placement in D-fructose. D-fructose features its carbonyl group at the internal C-2 position, classifying it as a polyhydroxy ketone (ketose).

Step 4: Classify the isomerism type. Because these two sugars have the same chemical formula but contain different functional groups (an aldehyde versus a ketone), their relationship is an example of functional isomerism.

Final Answer: Functional isomerism

Answer: (A)

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Q64.

Solution**Concept:**

Parkinson's disease is a neurodegenerative disorder characterized by a loss of dopaminergic neurons within the substantia nigra, leading to a dopamine deficiency in the striatum. Neuropharmacological interventions aim to restore this neurotransmitter balance.

Solution:

Step 1: Understand the physiological barrier to dopamine. Exogenous dopamine cannot cross the blood-brain barrier (BBB) due to its polar structure, meaning it cannot be administered directly to treat central deficiencies.

Step 2: Analyze the properties of Levodopa (L-DOPA). Levodopa is a metabolic precursor of dopamine that can cross the BBB by utilizing amino acid transport systems.

Step 3: Trace the central conversion pathway. Once inside the central nervous system, Levodopa is decarboxylated by the enzyme aromatic L-amino acid decarboxylase (DOPA decarboxylase) directly into active dopamine.

Step 4: Identify the therapeutic outcome. This enzymatic conversion replenishes deficient dopamine levels within the striatum, helping to alleviate the motor symptoms of Parkinson's disease.

Final Answer:

Metabolic conversion into dopamine in the central nervous system to replenish deficient levels

Answer: (A)

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Q65.

Solution**Concept:**

Medicinal chemistry classifies local anesthetic molecules based on the intermediate chain that links their lipophilic aromatic head to their hydrophilic tertiary amine tail. This linkage determines both their metabolic stability and duration of action.

Solution:

Step 1: Analyze the structure of the amide class of local anesthetics. Anesthetics like Lidocaine, Prilocaine, and Bupivacaine feature an amide linkage ($-\text{NH}-\text{CO}-$) as their central bridge.

Step 2: Contrast with the ester class. Ester-linked anesthetics like procaine and tetracaine contain a central ester carbon bridge ($-\text{CO}-\text{O}-$).

Step 3: Identify the distinctive structural moiety. The amide class is characterized by an amide linkage that separates a lipophilic aromatic ring system from a hydrophilic substituted amine group.

Step 4: Understand the metabolic consequence. The amide bond is more stable against enzymatic hydrolysis than an ester bond, giving amide-type anesthetics a longer duration of action and requiring hepatic metabolism.

Final Answer:

An amide linkage separating a lipophilic aromatic ring from a hydrophilic amine

Answer: (A)

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Q66.

Solution**Concept:**

Pharmaceutical stability testing measures how environmental parameters like temperature, humidity, and light influence the degradation rate of a drug formulation. The Arrhenius equation models the relationship between temperature and chemical reaction rates.

Solution:

Step 1: State the logarithmic form of the Arrhenius equation:

$$\ln k = \ln A - \frac{E_a}{RT}$$

Step 2: Identify the variables in the equation:

k = Reaction rate constant

A = Frequency or pre-exponential factor

E_a = Activation energy

R = Ideal gas constant

T = Absolute temperature in Kelvin

Step 3: Analyze the relationship modeled. The equation shows that the reaction rate constant (k) varies exponentially with changes in absolute temperature (T).

Step 4: Determine its clinical application. In stability studies, the Arrhenius equation is used in accelerated stability testing to predict a drug's shelf-life at room temperature based on degradation rates observed at elevated temperatures.

Final Answer:

Answer: (A)

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Q67.

Solution**Concept:**

The autonomic nervous system (ANS) regulates involuntary visceral functions through two anatomically and physiologically distinct divisions: the sympathetic and parasympathetic systems. These pathways often exert opposing control over target organs.

Solution:

Step 1: Analyze the physiological response specified in the prompt. The response involves pupillary dilation (mydriasis), an elevated heart rate, and bronchial dilation, which occur during perceived stress or physical threat.

Step 2: Identify the primary system active during emergencies. The sympathetic nervous system coordinates the body's acute stress response, often called the "fight or flight" response.

Step 3: Trace neurotransmitter activation. Postganglionic sympathetic fibers release norepinephrine, which activates adrenergic receptors on target organs to prepare the body for physical exertion.

Step 4: Contrast with the parasympathetic system. The parasympathetic system manages "rest and digest" functions, slowing the heart rate and causing pupillary constriction to conserve metabolic energy.

Final Answer: Sympathetic nervous system

Answer: (A)

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Q68.

Solution**Concept:**

Diuretics promote urine production by inhibiting specific solute transport proteins located along the endothelial lining of the nephron, reducing water reabsorption.

Solution:

Step 1: Identify the clinical classification of Furosemide. Furosemide is a high-ceiling loop diuretic that targets transport systems within the renal medulla.

Step 2: Locate its primary site of action. Furosemide acts along the thick ascending limb of the loop of Henle, a nephron segment responsible for reabsorbing approximately 25% of filtered sodium.

Step 3: Identify the molecular target. It binds competitively to the chloride-binding site of the luminal $\text{Na}^+/\text{K}^+/\text{2Cl}^-$ cotransporter (NKCC2), blocking the transport of sodium, potassium, and chloride ions.

Step 4: Trace the diuretic outcome. Inhibiting this cotransporter prevents the kidneys from creating a hypertonic medullary interstitium, which reduces osmotic water reabsorption in the collecting duct and increases urine volume.

Final Answer: Inhibition of the $\text{Na}^+/\text{K}^+/\text{2Cl}^-$ cotransporter in the thick ascending limb of the loop of Henle

Answer: (A)

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Q69.

Solution**Concept:**

The human axial skeleton includes the vertebral column, a segmented bony structure divided into distinct anatomical regions: cervical, thoracic, lumbar, sacral, and coccygeal. Each region contains a fixed number of vertebrae in typical anatomy.

Solution:

Step 1: Map the anatomical divisions of the human vertebral column from superior to inferior. The segments are arranged as follows:

Cervical spine (neck region) = 7 vertebrae (C1–C7)

Thoracic spine (upper back) = 12 vertebrae (T1–T12)

Lumbar spine (lower back) = 5 vertebrae (L1–L5)

Step 2: Complete the lower structural mapping. Below the lumbar region lies the sacrum (formed by 5 fused vertebrae) and the coccyx (formed by 4 fused coccygeal segments).

Step 3: Isolate the lumbar region data. The lumbar segment of the lower back contains 5 distinct unfused vertebrae designed to support the majority of upper body weight.

Final Answer:

Answer: (A)

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Q70.

Solution**Concept:**

The cardiovascular system relies on two main circuits: the systemic circulation and the pulmonary circulation. Blood vessels are classified as arteries or veins based on the direction of blood flow relative to the heart chambers.

Solution:

Step 1: Trace blood flow through the right side of the heart. Deoxygenated blood returns from systemic tissues via the vena cava into the right atrium, passes through the tricuspid valve, and enters the right ventricle.

Step 2: Analyze ventricular contraction. When the right ventricle contracts, it pumps deoxygenated blood through the pulmonary semilunar valve into the pulmonary trunk.

Step 3: Identify the branching vessels. The pulmonary trunk splits into the right and left pulmonary arteries, which carry this deoxygenated blood directly to the respiratory organs (the lungs) for gas exchange.

Step 4: Clarify the terminology. Although arteries typically carry oxygenated blood, the pulmonary artery is an exception because it carries deoxygenated blood away from the heart toward the lungs.

Final Answer: Pulmonary artery

Answer: (A)

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Q71.

Solution**Concept:**

The human gastrointestinal tract is divided into anatomical segments optimized for specific stages of mechanical breakdown, enzymatic digestion, and nutrient absorption. The small intestine is split into three sequential regions.

Solution:

Step 1: Outline the regions of the small intestine. The small intestine consists of the duodenum, the jejunum, and the ileum, which form a continuous pathway for chyme.

Step 2: Analyze the role of the duodenum. The proximal duodenum receives acidic chyme from the stomach along with bile and pancreatic enzymes, serving as the primary site for neutralizing acid and initiating chemical digestion.

Step 3: Analyze the role of the jejunum. The middle segment, the jejunum, features a high density of circular folds (plicae circulares), villi, and microvilli that create a large surface area.

Step 4: Identify the primary site for absorption. This structural specialization makes the jejunum the primary site where the majority of enzymatic digestion is completed and nutrients are absorbed into circulation.

Final Answer:

Answer: (A)

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Q72.

Solution**Concept:**

The endocrine system utilizes feedback loops where tropic hormones released by the anterior pituitary gland stimulate peripheral endocrine glands to synthesize and secrete specific hormones.

Solution:

Step 1: Analyze the target organ specified. The physiological target is the adrenal cortex, specifically the cells within the zona fasciculata and zona reticularis that produce glucocorticoids like cortisol.

Step 2: Trace the hypothalamic-pituitary-adrenal (HPA) axis. In response to stress or low circulating cortisol levels, the hypothalamus releases corticotropin-releasing hormone (CRH).

Step 3: Identify the pituitary tropic response. CRH stimulates corticotrope cells in the anterior pituitary gland to synthesize and secrete adrenocorticotrophic hormone (ACTH) into the bloodstream.

Step 4: Connect hormone to target function. ACTH binds to specific melanocortin receptors on the adrenal cortex, activating intracellular cascades that drive the synthesis and release of glucocorticoids.

Final Answer: Adrenocorticotrophic hormone (ACTH)

Answer: (A)

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Q73.

Solution**Concept:**

Taxonomical classification groups crude drugs based on shared botanical families and evolutionary lineages. Identifying a plant's family helps predict its secondary metabolite profile and morphological features.

Solution:

Step 1: Identify the crude drug source. Cinchona (commonly known as Peruvian bark) consists of the dried bark of trees belonging to the genus *Cinchona*, such as *Cinchona officinalis* or *Cinchona succirubra*.

Step 2: Identify the main active phytochemicals. Cinchona bark contains quinoline alkaloids, primarily quinine and quinidine, which are used as antimalarial and antiarrhythmic agents.

Step 3: Determine the botanical family. The genus *Cinchona* belongs to the Rubiaceae family, which is characterized by opposite leaves and interpetiolar stipules.

Step 4: Differentiate from alternative families. Solanaceae includes tropane-yielding plants like belladonna, Umbelliferae includes volatile-oil plants like fennel, and Leguminosae includes senna, confirming Rubiaceae as the correct family.

Final Answer:

Answer: (A)

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Q74.

Solution**Concept:**

Agricultural and collection standards for medicinal plants use structured cultivation techniques to manage environmental variables. Controlling these parameters helps ensure uniform chemical yields and high-quality raw materials.

Solution:

Step 1: Define organized cultivation. This approach involves planting, managing, and harvesting medicinal species under controlled ecological conditions like soil pH, hydration levels, temperature, and shade.

Step 2: Identify the primary benefit of cultivation. Unlike wild harvesting, organized cultivation standardizes the growth environment, minimizing variations in secondary metabolite concentration caused by environmental fluctuations.

Step 3: Differentiate from alternative options. Wild harvesting relies on collecting unmanaged native plants, adulteration is the fraudulent substitution of raw materials, and organoleptic evaluation uses sensory characteristics to assess quality.

Final Answer: Cultivation and propagation

Answer: (A)

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Q75.

Solution**Concept:**

Crude drug commerce requires strict quality control to detect fraudulent substitutions or accidental contamination. Replacing genuine botanical materials with inferior substances compromises both formulation safety and therapeutic efficacy.

Solution:

Step 1: Analyze the practice described. The scenario involves intentionally substituting a genuine, pharmacopoeial crude drug with an inferior look-alike material that lacks the required active constituents.

Step 2: Identify the technical term for this practice. The intentional or accidental degradation of a drug's purity or identity via substitution with exhausted, inferior, or synthetic material is defined as adulteration.

Step 3: Differentiate from quality control terms. Evaluation and standardization are analytical practices used to confirm a drug's identity and strength, whereas Lycopodium spore analysis is a specific microscopic method used to count particles.

Final Answer: Adulteration

Answer: (A)

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Q76.

Solution**Concept:**

Phytotherapy and traditional medicine systems classify certain plants as adaptogens. These herbal drugs contain secondary metabolites that help the body adapt to physiological and psychological stress, modulating immune responses and restoring homeostasis.

Solution:

Step 1: Analyze the therapeutic properties required. The drug must possess documented adaptive, stress-relieving, and immunomodulatory properties.

Step 2: Evaluate Ashwagandha (*Withania somnifera*). Belonging to the Solanaceae family, its roots contain active withanolides (steroidal lactones) that reduce systemic cortisol levels, act as central nervous system adaptogens, and boost non-specific immunity.

Step 3: Evaluate the alternatives. Digitalis is a cardiotonic containing cardiac glycosides; Senna contains anthraquinone glycosides used as a laxative; Clove contains eugenol, used primarily as a topical dental analgesic and carminative.

Final Answer: Ashwagandha (*Withania somnifera*)

Answer: (A)

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Q77.

Solution**Concept:**

Carbohydrate metabolism occurs via sequential enzymatic pathways located within specific subcellular compartments. The localization of these enzymes determines where anaerobic and aerobic breakdown phases take place within the cell.

Solution:

Step 1: Analyze the metabolic pathway. Glycolysis is the ancient metabolic pathway that breaks down one molecule of glucose into two molecules of pyruvate, generating a net yield of 2 ATP and 2 NADH.

Step 2: Determine its oxygen independence. The initial steps of glycolysis do not require molecular oxygen (O_2), allowing the pathway to function under both aerobic and anaerobic conditions.

Step 3: Locate the enzymes responsible. All ten soluble enzymes required to catalyze the glycolytic pathway are suspended freely within the intracellular fluid or cytoplasm.

Step 4: Contrast with alternative compartments. The mitochondrial matrix houses the pyruvate dehydrogenase complex and the citric acid cycle (Krebs cycle), which require oxygen to clear metabolites through the electron transport chain.

Final Answer:

Answer: (A)

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Q78.

Solution**Concept:**

Biological membranes rely on amphipathic lipid architectures to build stable, selectively permeable barriers. These structural lipids feature a polar region that interacts with aqueous environments and non-polar hydrocarbon regions that face inward.

Solution:

Step 1: Analyze the structural description. The lipid molecule must be an amphipathic component of biological membranes featuring a hydrophilic (polar) head group and two hydrophobic (non-polar) fatty acid tails.

Step 2: Evaluate the molecular geometry of phospholipids. Phospholipids consist of a glycerol or sphingosine backbone esterified to two fatty acid chains (tails) and a phosphate-containing polar head group.

Step 3: Trace membrane assembly. In water, these molecules spontaneously self-assemble into a dynamic lipid bilayer, orienting their hydrophilic heads toward the extra- and intracellular fluids and keeping their hydrophobic tails isolated in the interior.

Step 4: Exclude alternative lipid classes. Triacylglycerols serve as energy storage molecules in adipose tissue and contain three fatty acid chains, while cholesterol esters are highly hydrophobic storage lipids.

Final Answer:

Answer: (A)

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Q79.

Solution**Concept:**

Enzymes often require non-protein chemical components to stabilize their active sites or facilitate the transfer of functional groups during catalysis. These helper entities are classified based on their chemical composition and structural binding characteristics.

Solution:

Step 1: Analyze the specific terms in the prompt. The entity must be a non-protein, organic molecule that is loosely or reversibly bound to the protein portion of an enzyme and is essential for catalytic function.

Step 2: Define Coenzyme. Coenzymes are low-molecular-weight, non-protein organic molecules (often derived from vitamins, like NAD^+ , FAD, or Coenzyme A) that temporarily bind to an enzyme to assist in group-transfer reactions.

Step 3: Evaluate alternative enzyme terms. The protein shell itself is called the apoenzyme, which is catalytically inactive. When combined with its required cofactor or coenzyme, it forms the functional, complete enzyme complex known as a holoenzyme. A zymogen is an inactive enzyme precursor.

Final Answer:

Answer: (A)

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Q80.

Solution**Concept:**

Epidemiological surveillance metrics measure the distribution and frequency of diseases within human populations. Distinguishing between the total volume of existing cases and the rate of new infections helps public health programs allocate resources effectively.

Solution:

Step 1: Define prevalence in public health. Prevalence is a statistical measure that represents the total proportion or absolute count of individuals in a defined population who have a specific medical condition at a particular point in time (or over a specified period).

Step 2: Identify the components of prevalence. It includes all active cases—both long-standing, pre-existing chronic conditions (old cases) and newly diagnosed infections (new cases)—divided by the total population at risk.

Step 3: Contrast with incidence. Incidence measures only the number of newly diagnosed cases that appear within a specific time interval, serving as an indicator of the rate of new infection transmission.

Final Answer:

The total number of all active cases (both old and new) present in a population at a given point in time

Answer: (A)[Go Back to Question 80](#)

Q81.

Solution**Concept:**

Cold chain management maintains the potency of temperature-sensitive biological products throughout procurement, storage, and distribution. Deviations from recommended storage temperatures can irreversibly denature active protein antigens or live-attenuated vectors.

Solution:

Step 1: Identify the requirements for vaccines and sera. Most routine biological preparations, such as the Hepatitis B, DPT, and influenza vaccines, must be kept cold but protected from freezing.

Step 2: Recall the standard international cold chain storage limits. The standard temperature range for storing these products in hospital pharmacies, walk-in coolers, and refrigerators is strictly maintained between 2°C and 8°C.

Step 3: Analyze the hazards of alternative ranges. Sub-zero temperatures (below 0°C) can crack glass containers or destroy aluminum-adjuvanted vaccines via freezing, while temperatures above 8°C accelerate thermal degradation.

Final Answer:

Answer: (A)

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Q82.

Solution**Concept:**

Clinical pharmacy services focus on optimizing medication regimens, minimizing adverse events, and improving patient outcomes through direct evaluation of the patient's drug chart.

Solution:

Step 1: Define the primary responsibility of a clinical pharmacist. The clinical pharmacist reviews the active medication chart to ensure patient safety and verify that the drug regimen aligns with evidence-based guidelines.

Step 2: Analyze the components of a medication chart review. This evaluation includes checking for potential drug-drug interactions, therapeutic duplications, organ-based dosing adjustments (e.g., renal or hepatic adjustments), appropriate administration routes, and correct dosing frequencies.

Step 3: Contrast with administrative or commercial operations. Financial profit margins, vendor delivery lead times, and warehouse rack layouts are administrative or supply chain issues that do not directly involve clinical patient care.

Final Answer:

Answer: (A)

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Q83.

Solution**Concept:**

National health programs implement specialized screening, therapeutic protocols, and epidemiologic surveillance to control or eliminate endemic infectious diseases.

Solution:

Step 1: Identify the pathogen and disease characteristics from the prompt. The target disease is a contagious, chronic bacterial infection that primarily damages the skin, peripheral nerves, and upper respiratory mucosa. This description matches leprosy, which is caused by *Mycobacterium leprae*.

Step 2: Match the disease with the corresponding public health initiative in India. The National Leprosy Eradication Programme (NLEP) was established to detect cases early and provide free multidrug therapy (MDT) across all states.

Step 3: Evaluate alternative programs. The NACP targets HIV/AIDS, the NVBDCP manages vector-borne diseases like malaria and dengue, and the RNTCP (now NTEP) focuses on tuberculosis control.

Final Answer:

National Leprosy Eradication Programme
(NLEP)

Answer: (A)

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Q84.

Solution**Concept:**

Hospital inventory management uses selective control frameworks to prioritize stock keeping based on clinical criticality or financial consumption. The VED framework categorizes stock according to how crucial an item is for immediate patient survival.

Solution:

Step 1: Define the acronym components of VED. VED stands for Vital, Essential, and Desirable.

Step 2: Analyze each category's clinical significance. Vital items (V) are critical medications (e.g., epinephrine, anti-snake venom) that must be in stock at all times because their absence could directly result in patient death. Essential items (E) are necessary to manage severe illness but have a slightly higher tolerance for brief stockouts, while Desirable items (D) treat minor or self-limiting conditions.

Step 3: Identify the primary operational purpose. The framework allows the hospital pharmacy to prioritize its procurement and holding strategies based on the clinical necessity of the drugs for patient survival.

Final Answer:

To classify medicines based on their vital, essential, or desirable nature for patient survival

Answer: (A)

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Q85.

Solution**Concept:**

The procurement cycle in a hospital pharmacy involves systematic steps to ensure a reliable supply of high-quality medications while managing institutional funds responsibly. This cycle transitions from needs assessment to order placement and verification.

Solution:

Step 1: Outline the standard procurement sequence. The process begins with compiling inventory requisitions, followed by verifying funding, selecting validated suppliers, and issuing a formal purchase contract or order.

Step 2: Identify the core operational step. Generating and sending a formal purchase order to approved, verified pharmaceutical manufacturers or distributors is the primary administrative step that initiates the product supply chain.

Step 3: Differentiate from alternative options. Extemporaneous compounding is a manufacturing operation, direct patient vital monitoring is a clinical activity, and preparing tax returns is a corporate accounting task.

Final Answer:

Issuing a formal purchase order to validated vendors based on inventory requisitions

Answer: (A)[Go Back to Question 85](#)

Q86.

Solution**Concept:**

The Pharmacy Act 1948 provides the statutory framework for regulating the profession of pharmacy in India. It establishes regulatory bodies to oversee professional registration, educational standards, and pharmacy practice.

Solution:

Step 1: Review the statutory provisions for State Pharmacy Councils. While individual states normally form their own distinct State Pharmacy Councils, Section 19 of the Act allows for cooperative agreements between states.

Step 2: Analyze the purpose of a Joint State Pharmacy Council. Two or more participating states can enter into an agreement to establish a single, shared regulatory council to manage registration and professional oversight across their territories.

Step 3: Conclude the primary objective. This joint framework coordinates regulatory efforts and satisfies the registration and enforcement needs of multiple participating states through a single administrative body.

Final Answer:

To serve the pharmacy registration and regulatory needs of two or more participating states

Answer: (A)[Go Back to Question 86](#)

Q87.

Solution**Concept:**

Digoxin has a narrow therapeutic index (0.5–2.0 ng/mL), making regular clinical monitoring essential. Toxic accumulation leads to severe electrophysiological imbalances in cardiac conducting tissue and disrupts central nervous system pathways.

Solution:

Step 1: Analyze the physiological consequences of digitalis toxicity. Inhibiting Na^+/K^+ -ATPase pumps excessively increases intracellular calcium, which can trigger dangerous arrhythmias, enhance vagal tone, and cause severe bradycardia.

Step 2: Examine the neurological and sensory manifestations. Excess cardiac glycosides accumulate in retinal tissues, inhibiting localized transport enzymes and causing classic visual disturbances.

Step 3: Identify the characteristic visual symptom. Patients frequently experience xanthopsia, a condition where vision is tinted yellow or green, often accompanied by halos around light sources.

Step 4: Combine the clinical features. The presentation of severe sinus bradycardia alongside yellow-green xanthopsia is a classic diagnostic marker for acute digitalis overdose.

Final Answer:

Visual disturbances like xanthopsia (yellow-green vision) and severe bradycardia

Answer: (A)[Go Back to Question 87](#)

Q88.

Solution**Concept:**

Endocrine regulation maintains glucose homeostasis through balanced hormone secretion. Insulin is an anabolic hormone secreted by the pancreatic β -cells that drives the storage of blood glucose into peripheral tissues.

Solution:

Step 1: Identify the metabolic goal of insulin. Insulin lowers postprandial blood glucose levels by promoting glucose uptake into skeletal muscle and adipose tissue via GLUT-4 transporters.

Step 2: Trace the intracellular storage pathways. Once glucose enters hepatocytes or myocytes, insulin activates glycogen synthase, an enzyme that polymerizes free glucose into storage molecules called glycogen. This pathway is called glycogenesis.

Step 3: Evaluate alternative pathways. Gluconeogenesis (synthesis of glucose from non-carbohydrates), glycogenolysis (breakdown of glycogen into glucose), and lipolysis (breakdown of lipids) all raise blood sugar levels or provide alternative fuels, and are inhibited by insulin.

Final Answer:

Answer: (A)

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Q89.

Solution**Concept:**

Pharmacognosy organizes crude drugs using various classification systems to simplify their study, identification, and analytical testing. These frameworks categorize materials based on their physical, chemical, or biological properties.

Solution:

Step 1: Analyze the classification criteria specified. The system must group crude drugs based on the specific anatomical plant organ from which they are harvested, such as leaves, roots, seeds, or bark.

Step 2: Define morphological classification. This system divides crude drugs into organized structures (derived from cellular plant tissues, like leaves, roots, or flowers) and unorganized substances (derived via processing, like latex, extracts, or gums).

Step 3: Evaluate the alternative options. Alphabetical systems use Latin or English names; pharmacological systems group drugs by therapeutic action; chemotaxonomic systems link chemical constituents to botanical families. This leaves morphological classification as the correct match.

Final Answer: Morphological classification

Answer: (A)

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Q90.

Solution**Concept:**

Industrial drying operations remove moisture from wet granule masses to prepare them for tableting compression. Fluidized bed dryers use moving gas streams to fluidize and dry the product bed efficiently.

Solution:

Step 1: Analyze the mechanics of a fluidized bed dryer (FBD). In an FBD, heated air is passed upward through a perforated screen supporting a bed of wet granules at a velocity sufficient to lift and suspend the particles in the air stream.

Step 2: Define the state of fluidization. The suspended particle bed behaves like a boiling liquid, ensuring that every individual granule is completely surrounded by the moving stream of hot air.

Step 3: Identify the primary heat transfer mechanism. Heat transfer between a moving fluid phase (the heated air stream) and a solid phase (the wet granules) occurs primarily via convection.

Step 4: Note the thermal efficiency. This convective configuration creates a very large surface area for heat and mass transfer, leading to rapid, uniform drying throughout the material.

Final Answer:

Answer: (A)

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Q91.

Solution**Concept:**

Proteins are linear biopolymers composed of amino acid monomers linked together in a specific sequence. This primary structure is stabilized by strong covalent bonds formed via condensation reactions between adjacent monomers.

Solution:

Step 1: Analyze the functional groups of an amino acid. Each amino acid contains a central α -carbon bound to a primary amino group ($-\text{NH}_2$), a carboxylic acid group ($-\text{COOH}$), and a distinctive side-chain (R-group).

Step 2: Trace the bond formation process. During translation on the ribosome, the carboxylic acid group of one amino acid reacts with the amino group of the next amino acid.

Step 3: Identify the chemical linkage. This condensation reaction eliminates a molecule of water (H_2O) and forms a covalent amide linkage ($-\text{CO}-\text{NH}-$) known as a peptide bond.

Step 4: Distinguish from alternative biological linkages. Glycosidic bonds link carbohydrates, ester bonds join fatty acids to glycerol, and phosphodiester bonds form the backbone of nucleic acids, confirming the peptide bond as the primary linkage in proteins.

Final Answer:

Answer: (A)

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Q92.

Solution**Concept:**

Excitable cells like neurons maintain a stable electrical charge imbalance across their plasma membranes at rest. This resting membrane potential (typically around -70 mV) is generated and maintained by active transport proteins that move ions against their concentration gradients.

Solution:

Step 1: Identify the requirement for a resting potential. Cells must establish and maintain concentration gradients for sodium (Na^+) and potassium (K^+) ions across the plasma membrane, keeping potassium high inside and sodium high outside.

Step 2: Analyze the role of the Na^+/K^+ ATPase pump. This electrogenic carrier protein uses energy from ATP hydrolysis to pump exactly three Na^+ ions out of the cell for every two K^+ ions it moves inward.

Step 3: Evaluate the charge distribution. Moving more positive charges out than in creates a net negative charge inside the cell. This active transport, combined with potassium leaking out through open channels, generates the resting membrane potential.

Step 4: Differentiate from alternative options. Voltage-gated and ligand-gated channels facilitate the rapid passive flow of ions down their gradients during action potentials or synaptic transmission, rather than establishing the baseline resting state.

Final Answer:

Answer: (A)

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Q93.

Solution**Concept:**

The Drugs and Cosmetics Rules 1945 establish the legal qualifications, premises requirements, and minimum age restrictions necessary to secure retail or wholesale drug distribution licenses. These regulations protect public health by ensuring operations are managed by competent individuals.

Solution:

Step 1: Review the statutory requirements for a retail drug license. To apply for a license to operate a pharmacy, an applicant must satisfy conditions regarding technical qualifications, suitable premises, and legal age.

Step 2: Identify the minimum age requirement. Under the relevant provisions of the Drugs and Cosmetics Act and standard contract laws, an individual must have reached the age of majority, which is set at a minimum of 18 years, to legally apply for and hold a retail pharmacy license.

Step 3: Distinguish from educational requirements. While completing a pharmacy degree or registration may take longer, the minimum statutory age requirement to apply for the operating license itself is 18 years.

Final Answer:

Answer: (A)

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Q94.

Solution**Concept:**

Public health engineering aims to interrupt the transmission of infectious diseases by managing environmental vectors. Waterborne pathogens like *Vibrio cholerae* or *Giardia lamblia* rely on fecal-oral transmission routes via contaminated drinking water supplies.

Solution:

Step 1: Identify the primary mechanism for waterborne disease transmission. Parasitic and bacterial pathogens enter water supplies through sewage contamination and infect new hosts when contaminated water is consumed.

Step 2: Evaluate methods to disrupt this pathway. Implementing water purification, chemical sanitization (e.g., chlorination), and secure sewage infrastructure removes or inactivates these pathogens, breaking the chain of transmission.

Step 3: Contrast with alternative engineering options. Noise control, gaseous emission tracking, and radioactive waste management address important environmental hazards but do not directly influence the transmission of waterborne infectious pathogens.

Final Answer: Provision of safe water purification and sanitization structures

Answer: (A)

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Q95.

Solution**Concept:**

Patient counseling helps prevent clinically significant drug-food interactions that can interfere with medication absorption. Certain chemical functional groups on drug molecules can bind to divalent or trivalent metal cations in the digestive tract, forming insoluble complexes that cannot be absorbed.

Solution:

Step 1: Analyze the chemical properties of tetracyclines. Tetracycline antibiotics contain a core structure that readily binds to multi-charged metal cations, a process known as chelation.

Step 2: Identify dietary sources of these cations. Calcium (Ca^{2+}) is abundant in milk and dairy products, iron ($\text{Fe}^{2+}/\text{Fe}^{3+}$) is found in iron supplements, and magnesium (Mg^{2+}) or aluminum (Al^{3+}) are common components of antacids.

Step 3: Trace the pharmacokinetic consequence. Co-administering tetracyclines with these products leads to the formation of insoluble, non-absorbable chelates in the gastrointestinal tract, significantly reducing systemic antibiotic absorption and therapeutic efficacy.

Step 4: Formulate the proper clinical counseling advice. Pharmacists must instruct patients to avoid taking tetracyclines with milk, iron supplements, or antacids, and to space these items at least two hours apart.

Final Answer:

Avoid taking the medication with milk, iron supplements, or antacids as they decrease its absorption

Answer: (A)[Go Back to Question 95](#)

Q96.

Solution**Concept:**

Aromatic hydrocarbons exhibit lower thermodynamic energy and unique chemical reactivity compared to typical unsaturated alkenes. This stability is due to a continuous cyclic system of overlapping p-orbitals that allows electrons to move freely around the ring.

Solution:

Step 1: Analyze the chemical structure of benzene (C_6H_6). Benzene consists of a planar, hexagonal ring of six carbon atoms, with each carbon contributing one electron to a π -system.

Step 2: Understand electron delocalization. Instead of being locked into fixed, alternating single and double bonds, these six π -electrons are shared equally across the entire ring, creating a continuous cloud above and below the carbon plane.

Step 3: Identify the stabilizing effect. This symmetrical sharing of electrons is called resonance stabilization or delocalization. It lowers the potential energy of the molecule, creating a high activation energy barrier that resists addition reactions and favors substitution reactions that preserve the aromatic system.

Final Answer: Resonance stabilization and delocalization of π -electrons

Answer: (A)

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Q97.

Solution**Concept:**

The route of administration significantly influences a drug's bioavailability and pharmacokinetic profile. Meds absorbed from the gastrointestinal tract enter the portal venous system, which carries them directly to the liver before they can circulate to the rest of the body.

Solution:

Step 1: Trace the path of an orally administered drug. Once a tablet dissolves and passes through the intestinal epithelium, it is collected by the mesenteric veins and flows into the portal vein leading directly to the liver.

Step 2: Define hepatic extraction. The liver contains high concentrations of metabolic enzymes (such as the cytochrome P450 family). As the drug passes through the hepatic portal system, these enzymes can rapidly metabolize or clear a significant fraction of the dose.

Step 3: Identify the clinical term. This rapid clearance or chemical modification of a drug during its initial pass through the portal circulation, before it reaches systemic distribution, is defined as first-pass metabolism.

Step 4: Differentiate from other options. Enterohepatic recycling involves the biliary excretion and reabsorption of a drug, while bioactivation refers to converting an inactive prodrug into its active form.

Final Answer: First-pass metabolism

Answer: (A)

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Q98.

Solution**Concept:**

The brainstem links the higher cerebrum with the spinal cord and houses vital reflex centers. These autonomic centers process sensory inputs from chemoreceptors and baroreceptors to adjust heart rate, blood pressure, and ventilation in real time.

Solution:

Step 1: Locate the autonomic regulation centers of the brain. Basic homeostatic rhythms for survival are controlled by nuclei located within the lower brainstem.

Step 2: Analyze the role of the medulla oblongata. The medulla houses the cardiac center (which adjusts heart rate and force of contraction), the vasomotor center (which regulates blood vessel diameter to manage blood pressure), and the respiratory rhythmicity center (which sets the baseline pace of inhalation and exhalation).

Step 3: Evaluate alternative brain structures. The cerebrum manages higher cognitive thought, the cerebellum coordinates skeletal muscle balance, and the thalamus acts as a sensory relay station, making the medulla oblongata the correct structure.

Final Answer:

Answer: (A)

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Q99.

Solution**Concept:**

Qualitative phytochemical screening uses standardized chemical colorimetric tests to confirm the presence of specific classes of plant secondary metabolites based on their functional groups or ring systems.

Solution:

Step 1: Identify the target of the test. The question asks for the specific reagent that identifies the presence of alkaloids in a crude extract by forming a characteristic reddish-brown precipitate.

Step 2: Evaluate Dragendorff's reagent. Dragendorff's reagent is a solution of potassium bismuth iodide. When added to an acidic extract containing basic nitrogenous alkaloids, it forms a heavy, reddish-brown precipitate of bismuth-alkaloid complexes.

Step 3: Compare with alternative alkaloid reagents. Mayer's reagent (potassium mercuric iodide) yields a creamy white precipitate, Wagner's reagent (iodine in potassium iodide) produces a dark brown precipitate, and Hager's reagent (saturated picric acid) forms a yellow precipitate. Dragendorff's reagent is the correct match for a reddish-brown precipitate.

Final Answer: Dragendorff's reagent

Answer: (A)

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Q100.

Solution**Concept:**

Ketone bodies (acetoacetate, β -hydroxybutyrate, and acetone) are acidic metabolic byproducts formed when the body shifts from carbohydrate metabolism to extensive fatty acid oxidation for energy. Detecting significant levels of these compounds in urine indicates a metabolic crisis.

Solution:

Step 1: Analyze the pathology of insulin deficiency. In severe, uncontrolled Type 1 diabetes mellitus, a lack of insulin prevents cells from absorbing glucose from the bloodstream, causing cells to experience intracellular starvation despite high blood sugar levels.

Step 2: Trace the alternative lipid pathway. To generate energy, the body accelerates lipolysis, breaking down triglycerides into free fatty acids. The liver processes these fatty acids via β -oxidation, producing acetyl-CoA at a rate that overwhelms the citric acid cycle.

Step 3: Identify the condition. The liver converts excess acetyl-CoA into ketone bodies. As these acidic ketones accumulate in the blood, they spill over into the urine (ketonuria) and cause systemic metabolic acidosis, a life-threatening crisis known as diabetic ketoacidosis (DKA).

Final Answer:

Answer: (A)

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Answer Key

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	A	2	A	3	A	4	A	5	A
6	A	7	A	8	A	9	A	10	A
11	A	12	A	13	A	14	A	15	A
16	A	17	A	18	A	19	A	20	A
21	A	22	A	23	A	24	A	25	A
26	A	27	A	28	A	29	A	30	A
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41	A	42	A	43	A	44	A	45	A
46	A	47	A	48	A	49	A	50	A
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66	A	67	A	68	A	69	A	70	A
71	A	72	A	73	A	74	A	75	A
76	A	77	A	78	A	79	A	80	A
81	A	82	A	83	A	84	A	85	A
86	A	87	A	88	A	89	A	90	A
91	A	92	A	93	A	94	A	95	A
96	A	97	A	98	A	99	A	100	A

