JELET Pharmacy Sample Paper-9

Duration: 120 Minutes **Maximum Marks: 100**

Instructions

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

Q1. A prescription calls for 15 g of a 5% w/w salicylic acid ointment. The pharmacy has a 12% w/w salicylic acid ointment and petrolatum available. How many grams of the 12% w/w ointment are required to compound this prescription?

(A) 6.25 g

(B) 8.75 g

(C) 5.25 g

(D) 9.75 g

Q2. Which of the following cranial nerves is primarily responsible for transmitting taste sensations from the anterior two-thirds of the tongue?

(A) Glossopharyngeal nerve (CN IX)

(B) Facial nerve (CN VII)

(C) Vagus nerve (CN X)

(D) Trigeminal nerve (CN V)

Q3. In the context of Inventory Control, the “Lead Time” refers specifically to which of the following intervals?

(A) The time taken by the quality control department to clear a raw material batch

(B) The period between placing an order and its actual receipt in the pharmacy store

(C) The maximum shelf life remaining for a pharmaceutical product upon delivery

(D) The time required to exhaust the safety stock of a critical life-saving drug

Q4. Under the Drugs and Cosmetics Act 1940 and Rules 1945, the requirements, list of minimum equipment, and space standards for running a pharmacy store are comprehensively detailed under which schedule?

(A) Schedule N

(B) Schedule M

(C) Schedule P

(D) Schedule Y

Q5. Which of the following tests is classified as a specific diagnostic color reaction for detecting the presence of Ketone bodies in a patient's urine sample?

(A) Benedict's test

(B) Rothera's test

(C) Fouchet's test

(D) Hay's sulfur test

Q6. During a routine hospital ward inspection, a clinical pharmacist notices a patient experiencing severe dry cough after being prescribed a cardiovascular medication. Which drug class is most classically associated with this adverse event?

(A) Calcium channel blockers

(B) Angiotensin-converting enzyme (ACE) inhibitors

(C) Beta-adrenergic antagonists

(D) Thiazide diuretics

Q7. In the legal framework of the Pharmacy Act 1948, the Central Council (PCI) is required to be reconstituted every how many years?

(A) 3 years

(B) 5 years

(C) 6 years

(D) 10 years

Q8. Which specific cellular organelle is uniquely rich in hydrolytic enzymes functioning at an acidic pH and is responsible for intracellular macromolecular degradation?

(A) Peroxisome

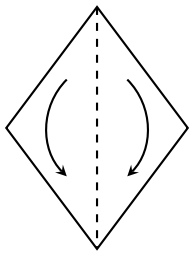
(B) Lysosome

(C) Golgi apparatus

(D) Rough endoplasmic reticulum

Q9. In the industrial manufacturing of tablets, which type of liquid flow pattern is considered most ideal inside a V-cone blender to achieve uniform solid-solid mixing?

V-Blender Cascade Flow



(A) Streamline laminar flow

(B) Shear and convective cascading flow

(C) Turbulent eddy diffusion

(D) Centrifugal plug flow

Q10. A chemical compound possesses an asymmetric carbon center with the highest priority group turning clockwise, but its lowest priority group (−H) is projecting

forward towards the observer. What is its absolute stereochemical configuration?

(A) *R*-configuration

(B) *S*-configuration

(C) *D*-configuration

(D) *L*-configuration

Q11. The Modified Limit Test for Sulphate utilizes an alcohol-specimen solution primarily to accomplish which structural or physical objective?

(A) To speed up the chemical reaction rate between barium and sulfate ions

(B) To prevent the supersaturation of barium sulfate and generate uniform turbidity

(C) To act as a color intensifier for visual matching comparisons

(D) To suppress the ionization of any volatile organic acidic impurities present

Q12. What specific anatomical structure functions as the primary pacemaker of the human heart by spontaneously generating action potentials at the highest frequency?

(A) Atrioventricular (AV) node

(B) Sinoatrial (SA) node

(C) Bundle of His

(D) Purkinje fibers

Q13. In public health microbiology, the "Schick Test" is an intradermal diagnostic test utilized to assess a patient's susceptibility status to which bacterial infection?

(A) Enteric typhoid fever

(B) Diphtheria

(C) Pulmonary tuberculosis

(D) Scarlet fever

Q14. What structural feature distinguishes a true alkaloid from a pseudoalkaloid during chemical classification?

(A) True alkaloids form crystalline precipitates with Mayer's reagent, pseudoalkaloids do not

(B) True alkaloids contain a nitrogen atom derived directly from an amino acid within a heterocyclic ring system

(C) True alkaloids are strictly derived from aliphatic terpenoid pathways without cyclic nitrogen

(D) True alkaloids do not show basic characteristics in solution

Q15. Under the provisions of the Narcotic Drugs and Psychotropic Substances (NDPS) Act 1985, the cultivation of opium poppy can only be undertaken in accordance with a license granted by which authority?

(A) State Pharmacy Council

(B) Narcotics Commissioner of India

(C) Drugs Controller General of India (DCGI)

(D) Union Ministry of Home Affairs

Q16. Which specific cardiac glycoside obtained from *Digitalis purpurea* is structurally classified as a secondary glycoside formed after the enzymatic loss of one glucose molecule?

(A) Purpurea glycoside A

(B) Digitoxin

(C) Purpurea glycoside B

(D) Lanatoside C

Q17. A patient is brought to the emergency department displaying pinpoint pupils, severe respiratory depression, and bradycardia. Opioid toxicity is suspected. Which structural drug acts as a pure competitive opioid receptor antagonist to reverse this state?

(A) Methadone

(B) Naloxone

(C) Buprenorphine

(D) Fentanyl

Q18. In the layout and architectural planning of a modern hospital pharmacy, what is the mandatory minimum floor area required to establish an institutional pharmacy store under normal regulatory standards?

(A) 100 sq ft

(B) 250 sq ft

(C) 500 sq ft

(D) 1000 sq ft

Q19. Which enzyme catalyzes the key rate-limiting step in human cholesterol biosynthesis, serving as the principal target for statin therapy?

(A) Fatty acid synthase

(B) HMG-CoA reductase

(C) Lipoprotein lipase

(D) Squalene epoxidase

Q20. In industrial sizing and grinding, "Kick's Law" states that the energy required to crush a given quantity of material is proportional to which parameter?

(A) The surface area of the new cracks created

(B) The logarithm of the ratio of initial to final product size

(C) The square root of the ratio of surface area to total volume

(D) The absolute volume reduction achieved during the process

Q21. When a prescription contains an ingredient that is chemically incompatible, leading to an oxidation-reduction reaction that degrades the active component, this is termed as which type of incompatibility?

(A) Therapeutic Incompatibility

(B) Physical Incompatibility

(C) Chemical Incompatibility

(D) Tolerated Incompatibility

Q22. Which of the following is an example of an organosilicon polymer widely used as an anti-foaming agent in antacid suspensions to relieve flatulence?

(A) Light liquid paraffin

(B) Simethicone

(C) Methylcellulose

(D) Magnesium trisilicate

Q23. In the classification of crude drugs, what is the primary structural feature that groups drugs under an "Organized Drug" category?

(A) They are solid materials obtained directly by simple expression methods

(B) They possess definitive cellular macroscopic and microscopic structures

(C) They consist of dried latices and plant exudates without cellular frameworks

(D) They dissolve completely in polar solvents like alcohol or hot water

Q24. During a patient counseling session regarding the use of sublingual nitroglycerin tablets, which instruction given by the community pharmacist is most critical?

(A) Chew the tablet thoroughly before swallowing with a full glass of water

(B) Place the tablet under the tongue and let it dissolve completely without swallowing it

(C) Take the medication immediately after a heavy fat-rich meal to avoid gastric ulceration

(D) Crush the tablet and mix it with warm milk to ensure uniform fast absorption

Q25. Which hormone is secreted by the parafollicular cells (C-cells) of the thyroid gland to lower blood calcium levels?

(A) Parathyroid hormone (PTH)

(B) Calcitonin

(C) Thyroxine (T_4)

(D) Triiodothyronine (T_3)

Q26. What physical mechanism explains the "Salting-out" phenomenon of a hydrophilic colloid when high concentrations of an inorganic salt like ammonium sulfate are added?

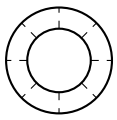
(A) The salt shifts the pH of the medium to the exact isoelectric point of the colloid

(B) The salt ions compete for and strip away the hydration layer surrounding the colloidal particles

(C) The salt undergoes a chemical displacement reaction forming an insoluble complex precipitate

(D) The salt decreases the overall ionic strength of the vehicle, destabilizing the suspension

Q27. When conducting an evaluation of a crude drug sample, the presence of stone cells (sclereids) and lignified trichomes is considered a key characteristic under which diagnostic methodology?



Thick Sclereid Cell Layer

(A) Physical Evaluation

(B) Microscopic Evaluation

(C) Organoleptic Evaluation

(D) Chemical Evaluation

Q28. Under the National Health Programs of India, the "DOTS" strategy is a core operational framework deployed globally for the control and eradication of which disease?

(A) Malaria

(B) Tuberculosis

(C) Leprosy

(D) HIV/AIDS

Q29. A solution has a hydronium ion concentration $[H_3O^+] = 2.0 \times 10^{-5}$ M. Given $\log_{10}(2) = 0.301$, what is the calculated pH of this pharmaceutical solution?

(A) 4.30

(B) 4.70

(C) 5.30

(D) 5.70

Q30. Which structural feature represents the core heterocyclic ring nucleus present in the molecular structure of the anti-epileptic drug Phenytoin?

(A) Phenothiazine

(B) Imidazolidinedione (Hydantoin)

(C) Benzodiazepine

(D) Pyrimidine-2,4,6-trione

Q31. Which of the following immunoglobulins is capable of crossing the human placental barrier to provide passive immunity to the developing fetus?

(A) IgM

(B) IgG

(C) IgA

(D) IgE

Q32. During a drug-use review in a hospital, a clinical pharmacist notes that a patient is concurrently prescribed Rifampicin and Oral Contraceptive Pills (OCPs). What is the expected clinical outcome of this interaction?

(A) Decreased metabolism of OCPs leading to toxic thromboembolic events

(B) Induction of hepatic CYP450 enzymes by Rifampicin leading to contraceptive failure

(C) Synergistic hepatotoxicity through competitive inhibition of biliary transport

(D) Enhanced plasma concentration of Rifampicin causing systemic red-orange discoloration

Q33. What type of vector is primarily responsible for transmitting the protozoan parasite *Plasmodium vivax* to humans, causing malaria?

(A) Female *Culex* mosquito

(B) Female *Anopheles* mosquito

(C) Male *Aedes aegypti* mosquito

(D) Female *Glossina* (Tsetse fly)

Q34. In organic reaction mechanisms, which species acts as a typical electrophile during the nitration of a benzene ring using a mixture of concentrated sulfuric acid and nitric acid?

(A) NO_2^-

(B) NO_2^+

(C) HNO_3

(D) NO_3^-

Q35. Which of the following analytical tools or indices is determined during the evaluation of fixed oils to primarily detect the extent of oxidative rancidity and free fatty acid generation?

(A) Saponification Value

(B) Acid Value

(C) Iodine Value

(D) Ester Value

Q36. In community pharmacy, an Over-the-Counter (OTC) medication is legally defined as:

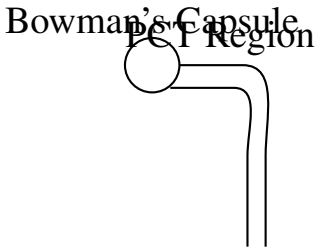
(A) A drug that can only be dispensed against a valid prescription written by a registered medical practitioner

(B) A drug that does not require a medical prescription and can be sold safely directly to the consumer

(C) A drug listed exclusively under Schedule H1 of the Drugs and Cosmetics Act

(D) A drug meant strictly for institutional clinical trial operations only

Q37. Which anatomical section of the human nephron is the primary site where the majority (65% – 70%) of filtered water, sodium, and potassium ions are reabsorbed into the peritubular capillaries?



(A) Distal convoluted tubule

(B) Proximal convoluted tubule

(C) Descending limb of the loop of Henle

(D) Collecting duct

Q38. What is the standard storage condition defined for a biological product labeled "Store in a cold place" according to official pharmacopoeial guidelines?

(A) Between −20°C and 0°C

(B) Between 2°C and 8°C

(C) Between 8°C and 25°C

(D) At a controlled room temperature of exactly 25°C

Q39. What type of physical incompatibility occurs when two solid drugs like camphor and menthol are mixed together at room temperature, resulting in liquefaction?

(A) Polymorphic transition

(B) Eutectic mixture formation

(C) Hygroscopic deliquescence

(D) Solvation desolvation

Q40. In medicinal chemistry, the design of Sulfamethoxazole as an antibacterial agent is based on its structural mimicry and competitive inhibition of which natural substrate?

(A) Dihydrofolate

(B) Para-aminobenzoic acid (PABA)

(C) Glutamic acid

(D) Tetrahydrofolate

Q41. A specimen of Cinchona bark contains several quinoline alkaloids. Which chemical test is specific for identifying Cinchona bark through the generation of an emerald green color upon treatment with bromine water and ammonia?

(A) Thalleioquin test

(B) Vitali-Morin test

(C) Murexide test

(D) Shinoda test

Q42. Which of the following structural parts of the human brain acts as the primary reflex center for regulating cardiovascular functions, respiration, and vasomotor tone?

(A) Cerebellum

(B) Medulla oblongata

(C) Hypothalamus

(D) Thalamus

Q43. Under the purchasing and procurement procedures of a hospital pharmacy, what does the term “Tendering” mean?

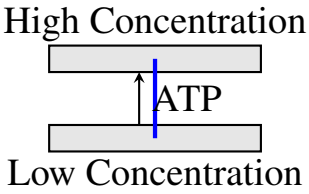
(A) Selling damaged surgical goods through a public retail auction

(B) A formal invitation to suppliers to submit competitive bids for supplying medicines over a fixed duration

(C) Directly procuring emergency medicines from local pharmacies without paperwork

(D) The system of verifying stock balances using electronic barcoding

Q44. Which transport process across cell membranes requires a specific carrier protein molecule and moves solutes against their electrochemical gradient, utilizing direct cellular ATP hydrolysis?



(A) Facilitated diffusion

(B) Primary active transport

(C) Simple passive diffusion

(D) Osmosis

Q45. In the formulation of a pharmaceutical emulsion, if the hydrophilic-lipophilic balance (HLB) value of an emulsifying agent is determined to be 14, this surfactant is best classified as a:

(A) Water-in-oil (w/o) emulsifying agent

(B) Oil-in-water (o/w) emulsifying agent

(C) Wetting and spreading agent

(D) Antifoaming agent

Q46. Which of the following trace minerals is an essential structural component of the human thyroid hormones Thyroxine and Triiodothyronine?

(A) Iron

(B) Iodine

(C) Zinc

(D) Selenium

Q47. During a clinical toxicology presentation, the antidote of choice for managing acute paracetamol (acetaminophen) poisoning to replenish hepatic glutathione stores is specified as:

(A) Atropine sulfate

(B) N-acetylcysteine

(C) Deferoxamine

(D) Flumazenil

Q48. Which metabolic pathway takes place entirely within the mitochondrial matrix of human cells and acts as the final common pathway for the oxidation of carbohydrates, lipids, and proteins?

(A) Glycolysis

(B) Citric Acid Cycle (Krebs Cycle)

(C) Pentose Phosphate Pathway

(D) Glycogenolysis

Q49. In general pharmacology, the term "Bioavailability" refers to which pharmacological parameter?

(A) The absolute rate at which a drug is metabolized by hepatic microsomal enzymes

(B) The rate and relative extent to which an active drug moiety reaches the systemic circulation intact

(C) The total volume of body fluid into which a drug is uniformly distributed

(D) The duration of time a drug remains bound to plasma albumin proteins

Q50. Which component of the human respiratory membrane plays the most critical functional role in lowering surface tension within the alveoli to prevent lung collapse during expiration?

(A) Alveolar macrophages

(B) Type II alveolar cells (Surfactant-producing)

(C) Ciliated pseudostratified columnar epithelium

(D) Elastic connective tissues

Q51. What quantitative parameter represents the specific pH at which a zwitterionic amino acid carries no net electrical charge and does not migrate in an electric field?

(A) Dissociation constant (pK_a)

(B) Isoelectric point (pI)

(C) Buffer capacity (β)

(D) Hydrophilic-lipophilic balance (HLB)

Q52. Which of the following secondary plant metabolites is structurally classified as a C-glycoside where the sugar is linked directly to a carbon atom of the aglycone, resisting normal acid hydrolysis?

(A) Sennoside A

(B) Aloin

(C) Amygdalin

(D) Sinigrin

Q53. A pharmaceutical factory needs to filter a heat-sensitive, thermolabile ophthalmic solution to remove viable microorganisms without applying heat. Which filter type is most appropriate?

(A) Sintered glass filter disc (pore size 2 μm)

(B) Membrane filter disc (pore size 0.22 μm)

(C) Rotary vacuum drum filter

(D) Filter press with asbestos pads

Q54. In the legal regulation of pharmacy practices, which of the following registers contains the names of professional pharmacists who are authorized to compound and dispense medicines within a state?

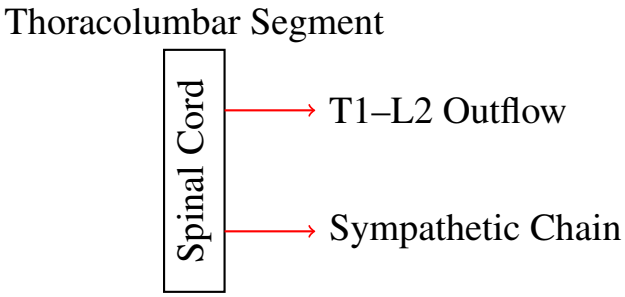
(A) The National Drug Formulary

(B) The First Register / Subsequent Register of Pharmacists

(C) The Schedule H Drug Logbook

(D) The Hospital Formulary List

Q55. Which component of the autonomic nervous system is dominated by thoracolumbar spinal outflow and initiates the classic "Fight-or-Flight" physiological stress response?



(A) Parasympathetic nervous system

(B) Sympathetic nervous system

(C) Somatic motor system

(D) Craniosacral system

Q56. When iron dextran injection or similar parenteral solutions are stored, a physical degradation process occurs where small particles grow larger at the expense of smaller ones due to differential solubility. This phenomenon is called:

(A) Flocculation

(B) Ostwald ripening

(C) Coalescence

(D) Phase inversion

Q57. In organic chemistry, the conversion of an alkyl halide to an alkene by treatment with alcoholic potassium hydroxide proceeds via which type of general organic reaction mechanism?

(A) Nucleophilic substitution (S_N2)

(B) Elimination reaction (E2)

(C) Electrophilic addition (A_E)

(D) Free radical substitution

Q58. What is the fundamental mechanism of action by which the antibiotic Penicillin G exerts its bactericidal effect on susceptible multiplying bacterial cells?

(A) Reversible binding to the 50S ribosomal subunit to inhibit protein synthesis

(B) Inhibition of transpeptidase enzymes to disrupt bacterial cell wall peptidoglycan synthesis

(C) Disruption of bacterial plasma membrane permeability through detergent action

(D) Binding to DNA-dependent RNA polymerase to block transcription

Q59. During an objective evaluation of a community health framework, which factor is considered the primary focus of "Family Welfare" services in public health programs?

(A) Industrial waste treatment and purification

(B) Maternal and child healthcare, alongside reproductive planning services

(C) Mandatory immunization of domestic cattle against zoonotic vectors

(D) Eradication of vector breeding zones in metropolitan drainage setups

Q60. A standard physiological solution of Normal Saline used for intravenous fluid replacement contains what exact concentration of sodium chloride (NaCl)?

(A) 0.45% w/v

(B) 0.90% w/v

(C) 5.00% w/v

(D) 3.00% w/v

Q61. Which of the following parameters represents a primary clinical test performed on blood samples to specifically assess the synthetic and excretory functions of the human liver?

(A) Serum Creatinine level

(B) Serum Bilirubin level

(C) Blood Urea Nitrogen (BUN)

(D) Glycated Hemoglobin ($HbA1c$)

Q62. What structural type of chemical bonding involves the equal or unequal sharing of valence electron pairs between two atoms of non-metallic elements?

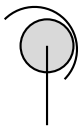
(A) Ionic bond

(B) Covalent bond

(C) Hydrogen bond

(D) Van der Waals interactions

Q63. In the anatomy of the human skeletal system, what type of joint allows for the widest range of free spatial movement in multiple planes, as seen in the shoulder and hip joints?



Ball and Socket Model

(A) Hinge joint

(B) Ball-and-socket joint

(C) Pivot joint

(D) Suture joint

Q64. During the cultivation and collection of crude drugs, what specific environmental factor or method is primary for preventing the enzymatic hydrolysis and decomposition of digitalis leaves immediately after harvesting?

(A) Drying the leaves at a low temperature of 20°C for two weeks

(B) Rapid drying of the leaves at a temperature below 60°C to inactivate enzymes

(C) Exposing the leaves to direct intense sunlight for several days

(D) Washing the fresh leaves with hot dilute sulfuric acid solution

Q65. Which of the following inorganic pharmaceutical compounds is used as an effective systemic antacid but can cause systemic alkalosis and fluid retention due to its highly soluble nature?

(A) Aluminum hydroxide gel

(B) Sodium bicarbonate

(C) Magnesium trisilicate

(D) Calcium carbonate

Q66. When evaluating the stability of a liquid formulation, what term describes the process where a reversible aggregation of dispersed droplets occurs in an emulsion, forming a concentrated layer at the top or bottom?

(A) Cracking

(B) Creaming

(C) Phase inversion

(D) Coalescence

Q67. What is the pharmacological mechanism of action of the drug Atropine when administered to a patient?

(A) Competitive antagonist at muscarinic acetylcholine receptors

(B) Reversible agonist at nicotinic neuromuscular junctions

(C) Selective blocker of alpha-1 adrenergic receptors

(D) Inhibitor of acetylcholinesterase enzymes in synapses

Q68. In community pharmacy practice, what is the prime objective of "Patient Counselling" during the dispensing process?

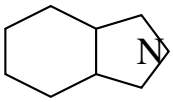
(A) To explain the financial profit margins of the generic drug substitutes to the patient

(B) To ensure the patient understands the correct administration, dosage schedule, and storage of their medication

(C) To diagnose the underlying chronic disease condition before the physician does

(D) To convince the patient to purchase expensive dietary supplements

Q69. Which of the following organic structures contains a fused bicyclic ring system consisting of a benzene ring fused to a five-membered nitrogen-containing pyrrole ring?



Indole Nucleus

(A) Quinoline

(B) Indole

(C) Isoquinoline

(D) Purine

Q70. In a hospital setup, the "Central Sterile Supply Department" (CSSD) is primarily responsible for which critical operational function?

(A) Preparing monthly financial balance sheets for the pharmacy stores

(B) Procuring and sterilizing medical instruments, dressings, and surgical goods for institutional use

(C) Organizing educational seminars for newly recruited medical interns

(D) Compounding large-volume parenterals under non-sterile conditions

Q71. What specific biochemical test is routinely employed to confirm a clinical diagnosis of Enteric (Typhoid) fever based on antigen-antibody agglutination?

(A) Western Blot test

(B) Widal test

(C) ELISA test

(D) Mantoux test

Q72. In the design of drug containers, which type of glass is highly resistant to chemical leaching and thermal shock, making it the premier choice for packaging parenteral preparations?

(A) Type I, Borosilicate glass

(B) Type II, Treated soda-lime glass

(C) Type III, Regular soda-lime glass

(D) Type NP, General-purpose soda-lime glass

Q73. Which of the following processes represents the primary mechanism by which the human body eliminates lipid-soluble drugs by transforming them into water-soluble metabolites via Phase I and Phase II reactions?

(A) Renal glomerular filtration

(B) Hepatic biotransformation

(C) Biliary active secretion

(D) Pulmonary exhalation

Q74. Which of the following structural parts of the human female reproductive tract is the normal anatomical site where fertilization of the ovum by a spermatozoon occurs?

(A) Endometrium of the uterus

(B) Fallopian tube (Ampulla)

(C) Cervical canal

(D) Ovarian cortex

Q75. What is the legal or scientific term used to describe the intentional or accidental addition of a lower-grade, cheap, or spurious substance to a pure crude drug sample?

(A) Evaluation

(B) Adulteration

(C) Cultivation

(D) Standardisation

Q76. Which structural parameter determines the structural classification of a carbohydrate as a "Reducing Sugar"?

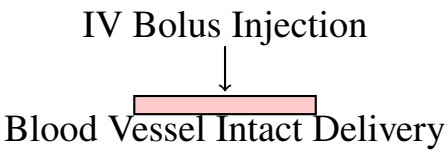
(A) The presence of a free or potentially free anomeric aldehyde or ketone group

(B) The presence of multiple ether linkages within the polysaccharide chain

(C) The absolute number of asymmetric carbon atoms in the open-chain form

(D) Its physical ability to rotate plane-polarized light clockwise

Q77. Which of the following routes of drug administration offers 100% systemic bioavailability by bypassing all physiological absorptive barriers and hepatic first-pass metabolism?



(A) Intramuscular route

(B) Intravenous route

(C) Subcutaneous route

(D) Oral route

Q78. What structural class of chemical agents is added to pharmaceutical formulations to resist large changes in pH when small amounts of acids or bases are introduced?

(A) Surfactants

(B) Buffer systems

(C) Chelating agents

(D) Preservatives

Q79. Which of the following local hormones (autacoids) is synthesized from arachidonic acid via the cyclooxygenase (COX) pathway and is involved in mediating inflammation and pain?

(A) Histamine

(B) Prostaglandin E_2

(C) Serotonin (5-HT)

(D) Bradykinin

Q80. In hospital pharmacy administration, what is a "Hospital Formulary"?

(A) A logbook containing the addresses of all registered drug manufacturers in the country

(B) A continuously revised compilation of pharmaceuticals selected by the medical staff for diagnostic and therapeutic utility in that hospital

(C) A billing file used to track patient insurance claims

(D) A regulatory text defining the minimum salary scales of clinical pharmacists

Q81. What type of quantitative analysis is a "Limit Test" in pharmaceutical chemistry?

(A) A highly sophisticated instrumental assay to determine the absolute purity percentage

(B) A semi-quantitative test designed to identify and control small traces of impurities within allowable specifications

(C) A qualitative test used exclusively to check the molecular weight of a compound

(D) A destructive thermal test to evaluate the boiling point of volatile oils

Q82. Which of the following is an example of a crude drug classified under the "Unorganized Drug" category, consisting of dried plant juice?

(A) Digitalis leaves

(B) Aloe

(C) Clove buds

(D) Senna leaflets

Q83. A solution contains a weak acid ($pK_a = 4.5$) and its conjugate salt. If the ratio of the concentration of salt to acid is 10 : 1, what is the pH of this buffer solution as calculated via the Henderson-Hasselbalch equation?

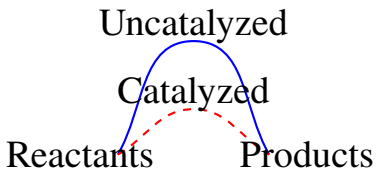
(A) 3.5

(B) 4.5

(C) 5.5

(D) 6.5

Q84. What is the primary biochemical role of enzymes in metabolic chemical reactions within the human body?



(A) To increase the total free energy change (ΔG) of the chemical reaction

(B) To lower the activation energy required for the reaction to proceed

(C) To shift the equilibrium position of a reversible reaction towards the products

(D) To act as stable irreversible reactants consumed completely in the process

Q85. Which of the following drugs is an example of a potent loop diuretic that acts by inhibiting the $Na^+/K^+/2Cl^-$ cotransporter in the thick ascending limb of the loop of Henle?

(A) Hydrochlorothiazide

(B) Furosemide

(C) Spironolactone

(D) Acetazolamide

Q86. Under the Drugs and Cosmetics Act 1940, biological and special products like insulin, sera, and vaccines are listed under which specific schedules?

(A) Schedule G and H

(B) Schedule C and C1

(C) Schedule X and Y

(D) Schedule J and K

Q87. Which structural feature characterizes a "Peptide Bond" that links individual amino acids together to form a primary protein structure?

(A) An ester linkage (−CO-O−)

(B) An amide linkage (−CO-NH−)

(C) An ether linkage (−O−)

(D) A disulfide bridge (−S-S−)

Q88. In industrial unit operations, what is the primary mechanism of heat transfer through a solid metallic wall of a jacketed reaction vessel?

(A) Convection

(B) Conduction

(C) Radiation

(D) Mass transfer

Q89. Which of the following parts of the human digestive tract contains specialized macroscopic folds called plicae circulares, villi, and microvilli to maximize the surface area for nutrient absorption?

(A) Stomach

(B) Small Intestine

(C) Large Intestine

(D) Esophagus

Q90. When a chemical drug undergoes degradation in solution due to the attack of atmospheric oxygen, what type of chemical reaction is this?

(A) Hydrolysis

(B) Oxidation

(C) Photolysis

(D) Isomerisation

Q91. Which of the following is an example of a natural herbal drug used as a potent cardiotonic agent, whose active constituents are steroidal glycosides?

(A) Black Pepper

(B) Digitalis

(C) Cinnamon

(D) Ginger

Q92. What structural functional group is formed when an alcohol molecule reacts with a carboxylic acid molecule under acidic conditions?

(A) Ether

(B) Ester

(C) Anhydride

(D) Ketone

Q93. In the anatomy of the human respiratory system, what structural rings keep the trachea continuously open and prevent it from collapsing during inhalation?

(A) Complete circular bony rings

(B) C-shaped hyaline cartilage rings

(C) Fibrous elastic tissue bands

(D) Smooth muscle circular sheets

Q94. Which of the following compounds is an inorganic pharmaceutical agent used as a powerful topical antimicrobial agent due to its oxidizing property, liberating nascent oxygen upon contact with organic matter?

(A) Sodium chloride

(B) Hydrogen peroxide

(C) Calcium hydroxide

(D) Ammonium chloride

Q95. In public health epidemiological terms, what does the term "Endemic" mean?

(A) A sudden, unexpected outbreak of a disease affecting a massive population across continents

(B) The constant, habitual presence of a disease or infectious agent within a specific geographic area or population group

(C) A disease that occurs only rarely and without any predictable geographic pattern

(D) A disease that has been completely eradicated worldwide through global vaccination

Q96. What is the primary therapeutic class of the drug Insulin, which is secreted by the beta cells of the islets of Langerhans in the pancreas?

(A) Oral hypoglycemic biguanide

(B) Antidiabetic peptide hormone

(C) Hyperglycemic glucocorticoid

(D) Proteolytic digestive enzyme

Q97. Which of the following parts of a medical prescription contains the specific instructions directed to the pharmacist regarding the dosage form and quantity of the drug to be prepared?

(A) Superscription

(B) Inscription

(C) Subscription

(D) Signatura

Q98. What quantitative analytical index represents the number of milligrams of potassium hydroxide (KOH) required to completely neutralize the free fatty acids present in one gram of a fat or oil sample?

(A) Saponification Value

(B) Acid Value

(C) Iodine Value

(D) Hydroxyl Value

Q99. Which of the following drugs is classified as a classic centrally acting sedative-hypnotic that acts by reinforcing the inhibitory action of gamma-aminobutyric acid (γ-aminobutyric acid / GABA) via allosteric modulation of the $GABA_A$ receptor complex?

(A) Diazepam

(B) Chlorpromazine

(C) Caffeine

(D) Morphine

Q100. In hospital pharmacy storage management, what inventory organization technique involves grouping items based on their critical consumption pattern into Vital, Essential, and Desirable categories?

(A) ABC Analysis

(B) VED Analysis

(C) FSN Analysis

(D) EOQ Model

Detailed Solutions

Q1.

Solution

Concept:

The allegation method can be applied to determine the ratio or proportion in which two dosage forms or ointments of different strengths must be mixed to obtain a desired target strength.

Solution:

Step 1: Identify the given values from the problem statement. The higher strength available (C_H) is 12% w/w, the lower strength available (C_L) is petrolatum which contains 0% w/w salicylic acid, and the desired target strength (C_T) is 5% w/w. The total required quantity of the final mixture is 15 g.

Step 2: Set up the allegation cross-multiplication pattern to find the parts of each component. Subtract the lower strength from the target strength to find the parts of the higher strength:

$$5\% - 0\% = 5 \text{ parts of } 12\% \text{ ointment}$$

Subtract the target strength from the higher strength to find the parts of the lower strength:

$$12\% - 5\% = 7 \text{ parts of petrolatum}$$

Step 3: Calculate the total number of parts by adding the parts of both ingredients together:

$$\text{Total parts} = 5 + 7 = 12 \text{ parts}$$

Step 4: Determine the required quantity in grams of the 12% w/w salicylic acid ointment by taking its proportional share over the total parts and multiplying by the final required weight:

$$\text{Weight of 12\% ointment} = \left(\frac{5}{12}\right) \times 15 \text{ g}$$

$$\text{Weight of 12\% ointment} = \frac{75}{12} = 6.25 \text{ g}$$

Step 5: Verify that mixing 6.25 g of the 12% ointment with 8.75 g of petrolatum yields exactly 15 g of a 5% concentration. The math balances perfectly.

Final Answer: 6.25 g

Answer: (A)

Go Back to Question 1

Q2.

Solution

Concept:

Taste sensation from the tongue is carried by different cranial nerves depending on the anatomical zone. The anterior two-thirds of the tongue relies on a different pathway than the posterior one-third.

Solution:

Step 1: Analyze the nerve supply of the tongue for special sensory (taste) perception. The tongue is divided anatomically into an anterior two-thirds portion and a posterior one-third portion.

Step 2: Trace the path of the anterior two-thirds. Taste buds in this specific area are innervated by the chorda tympani branch, which is a structural branch of the seventh cranial nerve, known as the Facial nerve (CN VII).

Step 3: Differentiate this from other cranial nerves. The Glossopharyngeal nerve (CN IX) is responsible for supplying both general sensation and taste to the posterior one-third of the tongue.

Step 4: Examine the Vagus nerve (CN X), which carries taste signals from the epiglottis and extreme posterior pharyngeal region, whereas the Trigeminal nerve (CN V) via the lingual nerve provides only general somatic sensation (hot, cold, pressure, touch) to the anterior two-thirds, not taste.

Step 5: Therefore, the cranial nerve primarily assigned to transmit taste from the anterior two-thirds region is definitively identified as the Facial nerve.

Final Answer: Facial nerve (CN VII)

Answer: (B)

Go Back to Question 2

Q3.

Solution

Concept:

In drug store and business management, inventory control parameters must be precisely defined to maintain stock optimization, avoid stockouts, and manage supply logistics.

Solution:

Step 1: Define Lead Time in inventory control theory. Lead time represents the entire temporal span consumed from the exact point a purchase requisition or order is placed until the items are delivered and accepted.

Step 2: Break down the components of lead time. It encompasses order preparation time, supplier processing time, transit time, receiving inspection, and quality assurance clearance before placement on pharmacy shelves.

Step 3: Evaluate option boundaries. Lead time does not mean the internal laboratory testing duration by the quality control wing, nor does it mean the residual shelf life of an item or the depletion period of safety buffers.

Step 4: Recognizing the lead time allows a hospital pharmacist to accurately calculate the reorder point (ROP) using the formula:

$$\text{ROP} = (\text{Average Daily Consumption} \times \text{Lead Time}) + \text{Safety Stock}$$

Step 5: Therefore, the term represents the exact operational interval occurring between the initiation of an order and its final warehouse receipt.

Final Answer: The period between placing an order and its actual receipt in the pharmacy store

Answer: (B)

Go Back to Question 3

Q4.

Solution

Concept:

The Drugs and Cosmetics Rules 1945 contain various alphabetical schedules that prescribe guidelines, standards, requirements, and statutory classifications for pharmaceutical practices.

Solution:

Step 1: Review the statutory definitions of the specified schedules within the text of the Act. Schedule N specifically lays down the detailed minimum list of tools, books, specifications, and space area necessary to successfully run a retail pharmacy.

Step 2: Compare with Schedule M, which details the current Good Manufacturing Practices (cGMP) and infrastructural requirements for industrial factory premises.

Step 3: Analyze Schedule P, which prescribes the life period (expiry dates) and storage conditions for various categorized antibiotics, biologicals, and specialized formulations.

Step 4: Look at Schedule Y, which regulates clinical trials, documentation, and specific data generation protocols for importing or manufacturing a new drug entity.

Step 5: Based on this structural legislative division, Schedule N is the correct regulatory assignment governing the retail store operational standards.

Final Answer: Schedule N

Answer: (A)

Go Back to Question 4

Q5.

Solution

Concept:

Clinical pathology relies on distinct biochemical color-producing reagents to detect pathological metabolic breakdown products excreted in human clinical urine specimens.

Solution:

Step 1: Recall the key biochemical tests used for urine analysis. Ketone bodies (such as acetoacetate and acetone) are produced during high lipid metabolism or diabetic ketoacidosis.

Step 2: Examine Rothera's test mechanism. It involves treating the urine sample with solid ammonium sulfate, sodium nitroprusside crystals, and concentrated ammonia solution. The development of a purple or permanganate ring indicates a positive reaction for ketones.

Step 3: Compare with Benedict's test, which utilizes a cupric reagent to detect reducing sugars like glucose via a red cuprous oxide precipitate formation.

Step 4: Review Fouchet's test, which uses barium chloride and Fouchet's reagent containing ferric chloride to detect bile pigments (bilirubin), and Hay's test, which uses sulfur powder to check surface tension changes for bile salts.

Step 5: Thus, Rothera's test is uniquely and specifically assigned for the analysis of urinary ketone bodies.

Final Answer: Rothera's test

Answer: (B)

Go Back to Question 5

Q6.

Solution

Concept:

Cardiovascular medications can cause classic drug-induced adverse events due to systemic enzyme inhibition or structural changes in bradykinin concentrations.

Solution:

Step 1: Evaluate the mechanism of Angiotensin-Converting Enzyme (ACE) Inhibitors. These drugs inhibit the conversion of Angiotensin I to Angiotensin II in the renin-angiotensin-aldosterone system.

Step 2: Understand the secondary metabolic function of the ACE enzyme, which is also known as kininase II. This enzyme is responsible for the systemic degradation and inactivation of autacoid bradykinin in respiratory tissues.

Step 3: When ACE is blocked, bradykinin levels rise significantly within the pulmonary tract, causing localized irritation, prostaglandin synthesis, and sensory fiber activation.

Step 4: This physiological accumulation results in a classic side effect: a persistent, dry, non-productive cough that is entirely non-responsive to typical antitussive therapy.

Step 5: Other drug classes such as calcium channel blockers, beta-blockers, and thiazides do not inhibit bradykinin metabolism and are not associated with this respiratory cough profile.

Final Answer: Angiotensin-converting enzyme (ACE) inhibitors

Answer: (B)

Go Back to Question 6

Q7.

Solution

Concept:

The Pharmacy Act 1948 provides the legal framework for the composition, registration, and regular governance timeline of the Pharmacy Council of India (PCI).

Solution:

Step 1: Read the statutory clauses contained within Section 3, 4, and 7 of Chapter II of the Pharmacy Act 1948, which govern the constitution of the Central Council.

Step 2: Identify the statutory tenure of office for members of the council. The legislative text explicitly states that an elected or nominated member shall hold office for a term of five years from the date of nomination or election.

Step 3: Upon the completion of this statutory five-year timeline, the entire council must be formally reconstituted through fresh rounds of election and nomination from across all state bodies and academic institutes.

Step 4: Check other potential time frames like 3 years, 6 years, or 10 years, which are incorrect and do not match the statutory legal provisions of this Act.

Step 5: Thus, the Central Council is legally required to undergo reconstitution every 5 years.

Final Answer: 5 years

Answer: (B)

Go Back to Question 7

Q8.

Solution

Concept:

Cell biology classifies sub-cellular structures based on their internal enzymatic profiles and their specialized physiological functions in cellular metabolism.

Solution:

Step 1: Identify organelles associated with degradation. Lysosomes are membrane-bound cytoplasmic vesicles dedicated to processing worn-out organelles, macromolecules, and engulfed pathogens.

Step 2: Examine the internal environment of a lysosome. It maintains a highly acidic interior pH (approximately 4.5 to 5.0) driven by active proton-pumping vacuular H^+-ATPases.

Step 3: This acidic lumen contains over forty distinct types of hydrolytic enzymes, including acid phosphatases, proteases, nucleases, and lipases, which show optimal catalytic activity at low pH values.

Step 4: Contrast with peroxisomes, which contain oxidative enzymes like catalase for hydrogen peroxide control; the Golgi apparatus, which handles protein sorting; and the rough endoplasmic reticulum, which runs translation.

Step 5: Therefore, the lysosome is the organelle uniquely characterized by an acidic pH and hydrolytic digestive enzymes.

Final Answer: Lysosome

Answer: (B)

Go Back to Question 8

Q9.

Solution

Concept:

Industrial solid-solid blending in a V-cone blender relies on a specific gravity-driven mechanical action to achieve uniform material mixing without damaging particles.

Solution:

Step 1: Understand the geometry and mechanics of a V-cone blender. As the V-shaped shell rotates along its horizontal axis, the solid powder mass is continuously split and recombined.

Step 2: Analyze the internal movement of the bed. When the blender turns upside down, the material splits into two separate legs. As it rotates further, the materials cascade down and converge into a common pool.

Step 3: This specific action creates shear and convective cascading flow regimes. The mechanical displacement over the internal planes yields excellent blending uniformity for free-flowing solids.

Step 4: Contrast this with streamline laminar flow, which applies to fluids; turbulent eddy diffusion, which is typical for liquid mixers; and centrifugal plug flow, which locks powders against walls.

Step 5: Therefore, the primary and most effective flow pattern driving a V-cone blender is shear and convective cascading flow.

Final Answer: Shear and convective cascading flow

Answer: (B)

Go Back to Question 9

Q10.

Solution

Concept:

The Cahn-Ingold-Prelog (CIP) priority rules establish a systematic nomenclature system to determine the absolute configuration (R or S) of a stereocenter.

Solution:

Step 1: Recall the standard protocol for assigning absolute configuration. Assign priorities (1 to 4) to the four functional groups attached to the chiral center based on atomic number rules.

Step 2: Trace the path from priority group 1 to priority group 2, then to group 3. The problem states that this directional trajectory goes in a clockwise orientation.

Step 3: Evaluate the positioning of the lowest priority group (4, which is −H). Standard rules dictate that if group 4 is projecting directly away from the observer (on a dashed bond), a clockwise path indicates an R-configuration.

Step 4: However, if the lowest priority group (−H) is pointing forward towards the observer (on a wedged bond), the apparent stereochemical direction must be inverted.

Step 5: Inverting the clockwise (R) appearance due to the forward positioning of −H yields a final, absolute S-configuration.

Final Answer: S-configuration

Answer: (B)

Go Back to Question 10

Q11.

Solution

Concept:

Pharmacopoeial limit tests control ionic impurities using visual comparison assays that rely on creating a stable, reproducible suspension.

Solution:

Step 1: Understand the chemical principle of the limit test for sulfates. It is based on the precipitation reaction of soluble sulfates with barium chloride in an acidic medium, yielding insoluble barium sulfate ($BaSO_4$).

Step 2: Examine the role of the alcohol-specimen solution or the addition of alcohol in the formulation of the reagent. Alcohol reduces the overall solubility of barium sulfate in the aqueous test environment.

Step 3: This physical modification prevents the occurrence of supersaturation in the system. It ensures that the precipitation begins instantly and uniformly, generating a stable opalescence or turbidity.

Step 4: If alcohol were omitted, larger, irregular crystals could form or remain temporarily in solution, causing an incorrect visual reading against standard control solutions.

Step 5: Thus, alcohol ensures uniform physical dispersion by preventing supersaturation of the precipitating salt.

Final Answer: To prevent the supersaturation of barium sulfate and generate uniform turbidity

Answer: (B)

Go Back to Question 11

Q12.

Solution

Concept:

The intrinsic conduction system of the human heart consists of specialized neuromuscular tissue that initiates and propagates electrical impulses throughout the myocardium.

Solution:

Step 1: Identify the components of the cardiac conduction pathway: the Sinoatrial (SA) node, Atrioventricular (AV) node, Bundle of His, and Purkinje fibers.

Step 2: Analyze the self-excitation (pacemaker) capacity of each component. The SA node possesses the highest intrinsic rate of spontaneous depolarization, generating approximately 60 to 100 impulses per minute.

Step 3: Because its firing rate is faster than the intrinsic rates of the AV node (40 – 60 bpm) or the Purkinje system (20 – 40 bpm), it overrides all other regions and sets the fundamental sinus rhythm of the heart.

Step 4: The SA node is located in the superior wall of the right atrium, adjacent to the opening of the superior vena cava.

Step 5: Therefore, the primary physiological pacemaker responsible for setting the heartbeat is the Sinoatrial node.

Final Answer: Sinoatrial (SA) node

Answer: (B)

Go Back to Question 12

Q13.

Solution

Concept:

Public health epidemiology uses intradermal skin tests to evaluate a patient's immune or susceptibility status against specific bacterial exotoxins.

Solution:

Step 1: Identify the causative agent and diagnostic tests for Diphtheria. Diphtheria is a highly contagious upper respiratory tract infection caused by *Corynebacterium diphtheriae*.

Step 2: Understand the mechanism of the Schick Test. It involves the intradermal injection of a dilute, sterile dose of purified diphtheria toxin into the patient's forearm.

Step 3: If the patient lacks neutralizing antitoxin antibodies, a localized inflammatory skin reaction develops at the injection site within 24 to 48 hours, indicating susceptibility to the disease.

Step 4: Contrast this with tests for other conditions: typhoid utilizes the Widal serological test; tuberculosis uses the Mantoux tuberculin skin test.

Step 5: Consequently, the Schick test is explicitly designed to assess susceptibility to Diphtheria.

Final Answer: Diphtheria

Answer: (B)

Go Back to Question 13

Q14.

Solution

Concept:

Pharmacognosy classifies nitrogenous plant bases based on their biosynthetic precursors and the position of the nitrogen atom within their chemical architecture.

Solution:

Step 1: Define the category of a "true alkaloid". True alkaloids must fulfill two main criteria: they possess a nitrogen atom within a heterocyclic ring system, and they are biosynthesized directly from amino acid precursors.

Step 2: Contrast this with "pseudoalkaloids". Pseudoalkaloids possess a basic nitrogen atom, but they are not biosynthesized from amino acids; instead, they originate from pathways like terpenoids or purines (e.g., caffeine, conessine).

Step 3: Evaluate "protoalkaloids", which contain a nitrogen atom derived from an amino acid, but the nitrogen is located outside the heterocyclic ring system (e.g., ephedrine, colchicine).

Step 4: Both true and pseudoalkaloids can give positive precipitation reactions with general alkaloidal reagents such as Mayer's, Dragendorff's, or Wagner's reagents.

Step 5: Therefore, the presence of an amino-acid-derived nitrogen atom within a heterocyclic ring is the defining characteristic of a true alkaloid.

Final Answer: True alkaloids contain a nitrogen atom derived directly from an amino acid within a heterocyclic ring system

Answer: (B)

Go Back to Question 14

Q15.

Solution

Concept:

The Narcotic Drugs and Psychotropic Substances (NDPS) Act 1985 establishes central statutory control over the cultivation, production, and distribution of scheduled narcotic plants.

Solution:

Step 1: Review the statutory provisions of the NDPS Act 1985 regarding the cultivation of opium poppy (*Papaver somniferum*).

Step 2: The cultivation, collection, and processing of opium poppy are strictly controlled by the Central Government of India to prevent diversion into illicit channels.

Step 3: Section 5 of the Act authorizes the appointment of a Narcotics Commissioner of India, who possesses the exclusive regulatory power to issue licenses for opium poppy cultivation.

Step 4: State bodies, State Pharmacy Councils, and general administrative wings do not have the legal authority to grant permissions for managing narcotic crop fields.

Step 5: Thus, the Narcotics Commissioner of India is the designated authority for issuing these cultivation licenses.

Final Answer: Narcotics Commissioner of India

Answer: (B)

Go Back to Question 15

Q16.

Solution

Concept:

Digitalis glycosides undergo predictable enzymatic cleavage steps during post-harvest processing, transforming primary glycosides into secondary glycosides.

Solution:

Step 1: Understand the chemical composition of fresh *Digitalis purpurea* leaves. The leaves naturally contain primary glycosides known as Purpurea glycoside A and Purpurea glycoside B.

Step 2: Examine the structural breakdown of Purpurea glycoside A. It consists of the aglycone Digitoxigenin linked to three digitoxose sugar molecules and one terminal glucose molecule.

Step 3: During post-harvest storage and drying, co-existing hydrolytic enzymes (such as digipurpidase) cleave the terminal glucose molecule.

Step 4: The removal of this single glucose unit transforms the primary Purpurea glycoside A into the secondary glycoside, Digitoxin.

Step 5: Similarly, Purpurea glycoside B yields Gitoxin upon losing its glucose unit, while Lanatoside C is found in *Digitalis lanata*, not *purpurea*.

Final Answer: Digitoxin

Answer: (B)

Go Back to Question 16

Q17.

Solution

Concept:

Management of acute clinical drug toxicity requires competitive receptor antagonists that display high binding affinity but zero intrinsic efficacy.

Solution:

Step 1: Analyze the clinical signs of opioid overdose: respiratory depression, pinpoint pupils (miosis), and a comatose or bradycardic state due to hyperactivation of μ-opioid receptors.

Step 2: Identify the pharmacological profile of Naloxone. Naloxone is a pure, competitive antagonist at μ, κ, and δ opioid receptors, showing the highest relative affinity for the μ subtype.

Step 3: When administered intravenously, Naloxone rapidly displaces exogenous opioid agonists (such as morphine, heroin, or fentanyl) from receptor sites, reversing respiratory depression.

Step 4: Contrast this with Methadone, which is a long-acting μ agonist; Buprenorphine, which is a partial agonist; and Fentanyl, which is a potent full agonist.

Step 5: Therefore, Naloxone is the drug of choice to reverse opioid toxicity via competitive receptor antagonism.

Final Answer: Naloxone

Answer: (B)

Go Back to Question 17

Q18.

Solution

Concept:

Hospital pharmacy standards dictate the minimum spatial and layout planning configurations required to ensure safe compounding, distribution, and storage.

Solution:

Step 1: Review the statutory standards established by the Pharmacy Council of India and hospital pharmacy accreditation bodies regarding pharmacy layout dimensions.

Step 2: For a standard institutional hospital pharmacy attached to a baseline clinical facility, a minimum floor space area of 250 sq ft is required for the pharmacy store and dispensing section.

Step 3: This minimum area requirement scales up significantly as the total bed strength of the hospital increases (e.g., requiring separate parenteral compounding suites or manufacturing wings).

Step 4: The floor space must be well-ventilated, equipped with adequate cold storage devices, and physically partitioned to separate the compounding zone from raw material storage.

Step 5: Thus, 250 sq ft represents the mandatory minimum standard area.

Final Answer: 250 sq ft

Answer: (B)

Go Back to Question 18

Q19.

Solution

Concept:

Biochemical lipid homeostasis is regulated by metabolic feedback loops at key enzymatic steps, which serve as primary targets for lipid-lowering therapies.

Solution:

Step 1: Trace the intracellular pathway of hepatic cholesterol biosynthesis. The process begins with Acetyl-CoA molecules converting into Mevalonate.

Step 2: Identify the enzyme responsible for this conversion: 3-hydroxy-3-methylglutaryl-coenzyme A reductase, abbreviated as HMG-CoA reductase.

Step 3: This enzymatic step is the primary rate-limiting and committed milestone of the entire multi-step cholesterol pathway.

Step 4: Statin medications (such as Atorvastatin or Rosuvastatin) are structural analogs of HMG-CoA that competitively inhibit this enzyme, reducing endogenous cholesterol production and upregulating surface LDL receptors.

Step 5: Other enzymes listed, such as fatty acid synthase or lipoprotein lipase, regulate triglyceride synthesis and plasma lipoprotein clearance rather than the rate-limiting steps of cholesterol synthesis.

Final Answer: HMG-CoA reductase

Answer: (B)

Go Back to Question 19

Q20.

Solution

Concept:
Industrial size reduction processes conform to specific energetic laws that correlate energy input with the physical dimensions of the material before and after milling.

Solution:
Step 1: Review the three primary mathematical relationships governing energy requirements in milling operations: Rittinger's Law, Kick's Law, and Bond's Law.

Step 2: State Kick's Law. It asserts that the energy required to crush a specific mass of material is constant for a given ratio of size reduction, irrespective of the initial absolute dimensions of the particles.

Step 3: Express Kick's Law mathematically:

$$E = K_K \ln\left(\frac{d_1}{d_2}\right)$$

where d_1 is the initial particle size, d_2 is the final particle size, and K_K is Kick's constant.

Step 4: This equation shows that energy usage is directly proportional to the logarithm of the ratio of initial to final product size. Contrast this with Rittinger's law, which correlates energy directly with new surface area generation.

Step 5: Thus, the energy requirement is proportional to the logarithmic ratio of the feed size to the product size.

Final Answer: The logarithm of the ratio of initial to final product size

Answer: (B)

Go Back to Question 20

Q21.

Solution

Concept:

Prescription incompatibilities occur when mixing ingredients causes physical, chemical, or therapeutic changes that alter the safety or efficacy of a formulation.

Solution:

Step 1: Classify the categories of pharmaceutical incompatibilities: Physical, Chemical, and Therapeutic.

Step 2: Define physical incompatibility as a visual alteration in solubility, phase separation, or liquefaction without changes to the underlying molecular structure of the components.

Step 3: Define chemical incompatibility as an interaction that alters the molecular structure of an ingredient, typically via oxidation-reduction, acid-base neutralization, hydrolysis, or precipitation reactions.

Step 4: The problem notes that an oxidation-reduction reaction occurs, leading to degradation of the active component. Because this involves breaking and forming chemical bonds, it falls under the definition of a chemical incompatibility.

Step 5: Therapeutic incompatibility involves alterations in the expected in vivo pharmacological response due to drug-drug interactions. Therefore, this case is a chemical incompatibility.

Final Answer: Chemical Incompatibility

Answer: (C)

Go Back to Question 21

Q22.

Solution

Concept:

Gastrointestinal therapeutics utilize surface-active polymers to alter the surface tension of gas bubbles within the gastric lumen, aiding in their elimination.

Solution:

Step 1: Identify the clinical problem. Flatulence involves the accumulation of small, trapped gas bubbles in the gastrointestinal tract, causing discomfort and bloating.

Step 2: Evaluate the chemical nature of Simethicone. Simethicone is a mixture of fully methylated liquid siloxane polymers chemically stabilized with silica gel. It is structurally classified as an organosilicon polymer.

Step 3: Analyze its mechanism of action. It acts as an anti-foaming agent by lowering the surface tension of gas bubbles, causing them to coalesce into larger bubbles that can be easily eliminated via belching or flatus.

Step 4: Contrast with light liquid paraffin, which serves as a lubricant laxative; methylcellulose, which functions as a bulk-forming agent; and magnesium trisilicate, which acts as a chemical antacid.

Step 5: Thus, Simethicone is the organosilicon polymer used as an anti-foaming agent in these formulations.

Final Answer: Simethicone

Answer: (B)

Go Back to Question 22

Q23.

Solution

Concept:

Crude drugs are classified morphologically into organized and unorganized drugs based on their structural cellular characteristics.

Solution:

Step 1: Define organized drugs in pharmacognosy. Organized drugs consist of distinct, cellular plant or animal parts that retain their native anatomical structure (e.g., leaves, barks, roots, flowers).

Step 2: Define unorganized drugs. These are substances obtained from natural sources via processing steps like expression, incision, or extraction, and they lack a cellular matrix (e.g., juices, latex, gums, resins, fixed oils).

Step 3: Examine the diagnostic utility of this classification. Organized drugs can be identified using macroscopic and microscopic anatomical features, such as stomata, trichomes, and vascular bundles.

Step 4: Unorganized drugs lack cellular structures and are identified primarily through chemical, physical, and organoleptic testing methods.

Step 5: Therefore, possessing definitive cellular macroscopic and microscopic structures is the key characteristic of an organized drug.

Final Answer: They possess definitive cellular macroscopic and microscopic structures

Answer: (B)

Go Back to Question 23

Q24.

Solution

Concept:

Community pharmacy practice requires precise patient counseling to ensure medications are administered via the correct route to optimize absorption and efficacy.

Solution:

Step 1: Analyze the properties of nitroglycerin tablets. Nitroglycerin is used to manage acute angina pectoris and undergoes extensive first-pass hepatic metabolism if swallowed.

Step 2: Understand the role of the sublingual route. Placing the tablet under the tongue allows the drug to dissolve in salivary secretions and absorb directly across the oral mucosa into systemic circulation.

Step 3: This route bypasses the gastrointestinal tract and the liver, providing rapid therapeutic onset within minutes to relieve ischemic cardiac pain.

Step 4: If the patient chews, swallows, or crushes the tablet with food, the drug will enter the portal circulation and be metabolized into inactive metabolites, rendering it ineffective for acute symptoms.

Step 5: Therefore, the pharmacist must instruct the patient to let the tablet dissolve completely under the tongue without swallowing.

Final Answer: Place the tablet under the tongue and let it dissolve completely without swallowing it

Answer: (B)

Go Back to Question 24

Q25.

Solution

Concept:

Endocrine calcium homeostasis is regulated by opposing hormonal pathways that modulate osteoclast activity and renal calcium excretion.

Solution:

Step 1: Identify the cell types within the thyroid gland. The thyroid contains follicular cells, which synthesize thyroxine (T_4) and triiodothyronine (T_3), and parafollicular cells, also known as C-cells.

Step 2: Determine the endocrine product of parafollicular cells. These cells synthesize and secrete Calcitonin, a 32-amino acid peptide hormone.

Step 3: Analyze the physiological action of Calcitonin. It lowers blood calcium concentrations (Ca^{2+}) by inhibiting osteoclast-mediated bone resorption and increasing renal calcium excretion.

Step 4: Contrast this with Parathyroid Hormone (PTH), which is secreted by the parathyroid glands and acts to increase blood calcium levels.

Step 5: Thus, Calcitonin is the specific hormone secreted by thyroid parafollicular cells to reduce systemic calcium levels.

Final Answer: Calcitonin

Answer: (B)

Go Back to Question 25

Q26.

Solution

Concept:

The stability of hydrophilic colloidal dispersions depends on a protective hydration layer and surface electrical charges that prevent particle aggregation.

Solution:

Step 1: Understand the structure of hydrophilic colloids. These particles have a high affinity for the dispersion medium, forming a protective shell of water molecules around themselves.

Step 2: Analyze the effect of adding high concentrations of an inorganic salt like ammonium sulfate. The salt ions have a high charge density and a strong affinity for water molecules.

Step 3: These electrolyte ions compete with the colloid for the solvent, stripping away the hydration layer that stabilizes the colloidal particles.

Step 4: Deprived of their protective hydration shell, the colloidal particles aggregate and precipitate out of the dispersion. This process is known as "salting-out".

Step 5: This physical mechanism relies on the salt ions competing for and removing the hydration layer, rather than altering the pH to the isoelectric point or forming an insoluble chemical complex.

Final Answer: The salt ions compete for and strip away the hydration layer surrounding the colloidal particles

Answer: (B)

Go Back to Question 26

Q27.

Solution

Concept:

Crude drug evaluation utilizes specific diagnostic methodologies to confirm identity and detect adulteration based on morphological features.

Solution:

Step 1: Define the primary methods of crude drug evaluation: Organoleptic, Microscopic, Chemical, Physical, and Biological.

Step 2: Define microscopic evaluation. This method involves examining the internal cellular structures of a crude drug sample under a microscope using specific stains or reagents.

Step 3: Identify key microscopic diagnostic markers. Features such as stone cells (sclereids), specific types of trichomes, calcium oxalate crystals, starch grains, and vascular bundle arrangements are highly specific to individual plant species.

Step 4: Contrast with other evaluation methods. Physical evaluation measures constants like ash value and moisture content; organoleptic evaluation relies on sensory features like taste, color, and odor; chemical evaluation uses color tests or assays.

Step 5: Therefore, identifying internal cellular structures like stone cells falls under microscopic evaluation.

Final Answer: Microscopic Evaluation

Answer: (B)

Go Back to Question 27

Q28.

Solution

Concept:

National health programs deploy targeted operational frameworks to ensure patient compliance and monitor treatment outcomes for chronic infectious diseases.

Solution:

Step 1: Define the acronym DOTS: Directly Observed Treatment, Short-course. This strategy was developed by the World Health Organization (WHO) and implemented globally.

Step 2: Understand the operational model of DOTS. It requires a trained health worker or community volunteer to directly observe the patient swallowing each dose of medication, ensuring compliance and reducing the emergence of drug resistance.

Step 3: Identify the target disease. The DOTS framework is the cornerstone of the Revised National Tuberculosis Control Programme (RNTCP), currently integrated under the National Tuberculosis Elimination Programme (NTEP) in India.

Step 4: Contrast with other health programs. Malaria uses vector control and artemisinin-based combination therapies; leprosy uses multi-drug therapy (MDT); HIV/AIDS uses antiretroviral therapy (ART).

Step 5: Thus, the DOTS strategy is designed for the control and management of Tuberculosis.

Final Answer: Tuberculosis

Answer: (B)

Go Back to Question 28

Q29.

Solution

Concept:

The pH of a solution is defined as the negative logarithm (to the base 10) of its hydronium ion (H_3O^+) or hydrogen ion (H^+) concentration.

Solution:

Step 1: Recall the mathematical formula for calculating pH:

$$\text{pH} = -\log_{10}[H_3O^+]$$

Step 2: Substitute the given hydronium ion concentration (2.0×10^{-5} M) into the formula:

$$\text{pH} = -\log_{10}(2.0 \times 10^{-5})$$

Step 3: Expand the logarithmic expression using standard algebraic properties ($\log(a \times b) = \log a + \log b$):

$$\text{pH} = -[\log_{10}(2.0) + \log_{10}(10^{-5})]$$

$$\text{pH} = -[\log_{10}(2.0) - 5]$$

Step 4: Substitute the given value for $\log_{10}(2.0) = 0.301$ into the equation:

$$\text{pH} = -[0.301 - 5]$$

$$\text{pH} = -(-4.699) = 4.699 \approx 4.70$$

Step 5: Review the options to find the calculated value. The calculated pH of the solution is 4.70.

Final Answer: 4.70

Answer: (B)

Go Back to Question 29

Q30.

Solution

Concept:

Medicinal chemistry classifies synthetic drugs based on the core heterocyclic or carbocyclic ring systems present in their molecular architecture.

Solution:

Step 1: Analyze the chemical name and structure of Phenytoin. Phenytoin is chemically designated as 5, 5-diphenylimidazolidine-2,4-dione.

Step 2: Identify the core ring structure from the chemical name. The core five-membered ring containing two nitrogen atoms at positions 1 and 3 is an imidazolidinedione ring, commonly known as a hydantoin nucleus.

Step 3: Review the structures of the other options. Phenothiazine is a three-ring system found in antipsychotics like chlorpromazine; benzodiazepine contains a fused benzene and diazepine ring; pyrimidine-2,4,6-trione represents the barbiturate core.

Step 4: Phenytoin features two phenyl rings attached to carbon-5 of this central hydantoin ring system.

Step 5: Therefore, the core heterocyclic ring nucleus present in Phenytoin is the imidazolidinedione (hydantoin) ring.

Final Answer: Imidazolidinedione (Hydantoin)

Answer: (B)

Go Back to Question 30

Q31.

Solution

Concept:

Immunoglobulins serve distinct roles in humoral immunity based on structural differences that alter their ability to cross anatomical barriers.

Solution:

Step 1: Review the structural classes of human immunoglobulins: IgG, IgM, IgA, IgD, and IgE.

Step 2: Analyze the structural properties of Immunoglobulin G (IgG). IgG is a monomeric antibody that constitutes approximately 75% – 80% of the total serum immunoglobulins in the human body.

Step 3: Identify the unique transport mechanism of IgG. The placental syncytiotrophoblast expresses specific neonatal Fc receptors (FcRn) that bind to the Fc region of monomeric IgG molecules.

Step 4: This receptor-mediated transcytosis allows IgG to cross the placental barrier, providing passive immunity to the fetus during development.

Step 5: Other immunoglobulins, such as pentameric IgM or dimeric IgA, are too large or lack the necessary Fc receptor affinity to cross the placenta. Thus, IgG is the correct answer.

Final Answer: IgG

Answer: (B)

Go Back to Question 31

Q32.

Solution

Concept:

Concurrently administered drugs can interact via pharmacokinetic mechanisms, such as the induction or inhibition of hepatic cytochrome P450 (CYP450) enzymes.

Solution:

Step 1: Analyze the pharmacological properties of Rifampicin. Rifampicin is a core antitubercular agent known to be a potent inducer of hepatic microsomal enzymes, particularly the CYP3A4 isoenzyme.

Step 2: Analyze the pharmacokinetic profile of Oral Contraceptive Pills (OCPs). OCPs contain estrogenic and progestational steroids that are primary substrates for metabolism by the hepatic CYP3A4 pathway.

Step 3: Determine the effect of co-administration. Rifampicin induces an upregulation of CYP3A4 enzymes, accelerating the metabolic clearance of the contraceptive steroids.

Step 4: This rapid metabolism reduces plasma concentrations of the hormones below their therapeutic threshold, leading to a loss of contraceptive efficacy and potential failure.

Step 5: This interaction does not involve competitive inhibition, decreased metabolism, or direct synergistic hepatotoxicity. Therefore, it results in contraceptive failure due to enzyme induction.

Final Answer: Induction of hepatic CYP450 enzymes by Rifampicin leading to contraceptive failure

Answer: (B)

Go Back to Question 32

Q33.

Solution

Concept:

Vector-borne infectious diseases require specific biological vectors to complete their life cycles and transmit pathogens to human hosts.

Solution:

Step 1: Identify the pathogen and disease. *Plasmodium vivax* is a protozoan parasite that causes malaria in humans.

Step 2: Review the life cycle of the *Plasmodium* parasite. The sexual reproduction stage occurs within the digestive tract of the mosquito vector, making it the definitive host.

Step 3: Identify the specific mosquito vector. The transmission of malaria to humans occurs via the bite of an infected female *Anopheles* mosquito, which injects sporozoites during a blood meal.

Step 4: Contrast with other insect vectors. *Culex* mosquitoes transmit filariasis and West Nile virus; *Aedes aegypti* transmits dengue and yellow fever; the Tsetse fly (*Glossina*) transmits African sleeping sickness.

Step 5: Thus, the female *Anopheles* mosquito is the biological vector for malaria transmission.

Final Answer: Female Anopheles mosquito

Answer: (B)

Go Back to Question 33

Q34.

Solution

Concept:

Electrophilic aromatic substitution reactions involve the generation of a strongly electrophilic species that attacks the electron-dense pi-system of an aromatic ring.

Solution:

Step 1: Analyze the composition of nitrating acid. Nitrating acid is a mixture of concentrated nitric acid (HNO_3) and concentrated sulfuric acid (H_2SO_4).

Step 2: Trace the reaction mechanism that occurs when these components are mixed. Sulfuric acid is a stronger acid than nitric acid and protonates the hydroxyl group of the nitric acid molecule.

Step 3: The protonated nitric acid intermediate readily loses a water molecule (H_2O) to form a highly reactive, linear cationic species: the nitronium ion (NO_2^+).

$$HNO_3 + 2H_2SO_4 \rightleftharpoons NO_2^+ + H_3O^+ + 2HSO_4^-$$

Step 4: The nitronium ion (NO_2^+) carries a formal positive charge on the nitrogen atom, making it a strong electrophile that can attack the benzene ring to form a sigma complex.

Step 5: Species like NO_2^-, NO_3^-, or unprotonated HNO_3 do not act as the primary electrophile in this reaction. Thus, NO_2^+ is the correct species.

Final Answer: NO_2^+

Answer: (B)

Go Back to Question 34

Q35.

Solution

Concept:

The analytical evaluation of fixed oils and fats uses standardized chemical values to measure decomposition, purity, and structural characteristics.

Solution:

Step 1: Define Acid Value. The acid value is defined as the number of milligrams of potassium hydroxide required to neutralize the free fatty acids present in one gram of a fat or oil sample.

Step 2: Understand the relationship between acid value and rancidity. Storage of fixed oils under poor conditions can cause hydrolytic rancidity, where triglycerides break down into free fatty acids and glycerol.

Step 3: An elevated acid value indicates significant hydrolytic decomposition and oxidative rancidity within the fixed oil sample.

Step 4: Contrast with other indices. Saponification value indicates the average molecular weight of fatty acids; iodine value measures the degree of unsaturation; ester value quantifies glyceryl-bound fatty acids.

Step 5: Therefore, the acid value is the primary index used to monitor free fatty acid generation and rancidity.

Final Answer: Acid Value

Answer: (B)

Go Back to Question 35

Q36.

Solution

Concept:

The statutory classification of drugs establishes guidelines for the retail sale and dispensing of medications to protect public health.

Solution:

Step 1: Understand the definition of Over-the-Counter (OTC) medications. OTC drugs are consumer healthcare products that can be legally sold directly to the public without a prescription from a healthcare professional.

Step 2: Contrast OTC medications with prescription-only medications. Prescription-only medicines (such as those listed under Schedule H, H1, or X of the Drugs and Cosmetics Rules) require a valid order from a registered practitioner.

Step 3: OTC medications are selected for safety, low potential for misuse, and utility in self-limiting conditions when used according to label instructions.

Step 4: While the term "OTC" is widely used in commerce, these products are typically classified under non-prescription or open schedules within the regulatory framework of the Drugs and Cosmetics Act.

Step 5: Thus, an OTC drug is defined as a medication that does not require a prescription and can be sold directly to consumers.

Final Answer: A drug that does not require a medical prescription and can be sold safely directly to the consumer

Answer: (B)

Go Back to Question 36

Q37.

Solution

Concept:

Renal physiology relies on specialized anatomical segments along the nephron to reabsorb water and solutes from the glomerular filtrate.

Solution:

Step 1: Trace the path of fluid through the nephron: Bowman's capsule, proximal convoluted tubule (PCT), loop of Henle, distal convoluted tubule (DCT), and collecting duct.

Step 2: Analyze the transport capacity of the Proximal Convoluted Tubule (PCT). The PCT is lined with simple cuboidal epithelial cells featuring a dense brush border of microvilli that increases surface area.

Step 3: This segment is responsible for the bulk reabsorption of filtered solutes. It reabsorbs approximately 65% – 70% of the filtered water and sodium chloride (NaCl), and nearly 100% of filtered glucose and amino acids.

Step 4: Contrast with other segments. The loop of Henle regulates concentration gradients; the DCT and collecting ducts handle fine-tuning under hormonal control (e.g., aldosterone, ADH).

Step 5: Therefore, the proximal convoluted tubule is the primary site for the reabsorption of the majority of filtered water and electrolytes.

Final Answer: Proximal convoluted tubule

Answer: (B)

Go Back to Question 37

Q38.

Solution

Concept:

Pharmacopoeial standards define specific temperature ranges for storage conditions to preserve the stability and potency of pharmaceutical products.

Solution:

Step 1: Review the standardized temperature definitions specified in official pharmacopoeias (such as the Indian Pharmacopoeia or United States Pharmacopeia).

Step 2: Define "Cold place". A cold place is officially defined as a temperature environment maintained between 2°C and 8°C (36°F to 46°F). This range corresponds to standard refrigeration temperatures.

Step 3: Compare with other storage definitions. A "Cool place" is defined as any temperature between 8°C and 25°C; "Controlled room temperature" spans 20°C to 25°C; "Freezer storage" requires temperatures between -25°C and -10°C.

Step 4: Biological products like vaccines, insulin, and sera are frequently labeled with instructions to "Store in a cold place" to prevent denaturing or loss of potency.

Step 5: Thus, the official temperature range for a cold place is between 2°C and 8°C.

Final Answer: Between 2°C and 8°C

Answer: (B)

Go Back to Question 38

Q39.

Solution

Concept:

Physical incompatibilities can occur when mixing specific solid organic compounds lowers their combined melting point below room temperature.

Solution:

Step 1: Analyze the physical properties of camphor and menthol. Both substances are crystalline volatile solids at room temperature.

Step 2: Understand the behavior of eutectic mixtures. When camphor and menthol are mixed in specific proportions, intermolecular forces change, lowering the melting point of the mixture.

Step 3: If the combined melting point drops below ambient room temperature, the solid mixture liquefies without chemical modification. This composition is termed a eutectic mixture.

Step 4: Contrast with other physical behaviors. Hygroscopic substances absorb moisture from the air; deliquescent materials absorb enough water to dissolve; polymorphism involves distinct crystalline forms of a single compound.

Step 5: Thus, the liquefaction observed when mixing camphor and menthol is due to eutectic mixture formation.

Final Answer: Eutectic mixture formation

Answer: (B)

Go Back to Question 39

Q40.

Solution

Concept:

Antimetabolite antimicrobial therapies utilize structural analogs of natural substrates to competitively inhibit critical bacterial metabolic pathways.

Solution:

Step 1: Analyze the mechanism of action of sulfonamide antibiotics, including Sulfamethoxazole. Sulfonamides act as competitive inhibitors of the enzyme dihydropteroate synthase (DHPS) in the bacterial folic acid synthesis pathway.

Step 2: Identify the natural substrate for dihydropteroate synthase. The enzyme utilizes para-aminobenzoic acid (PABA) to synthesize dihydropteroate, a precursor to folic acid.

Step 3: Compare the chemical structures of Sulfamethoxazole and PABA. Sulfamethoxazole features a sulfonamide group attached to a benzene ring with a primary amine, making it a structural analog of PABA.

Step 4: Due to this structural similarity, Sulfamethoxazole binds competitively to DHPS, blocking bacterial folic acid synthesis and preventing bacterial replication.

Step 5: Humans absorb preformed folic acid from their diet and lack this pathways, making sulfonamides selectively toxic to bacteria. Thus, PABA is the correct substrate.

Final Answer: Para-aminobenzoic acid (PABA)

Answer: (B)

Go Back to Question 40

Q41.

Solution

Concept:

Chemical evaluation in pharmacognosy uses specific colorimetric tests to confirm the identity of characteristic alkaloids in crude drug samples.

Solution:

Step 1: Identify the primary alkaloids present in Cinchona bark (*Cinchona officinalis*), which include quinoline bases such as quinine and quinidine.

Step 2: Review the protocol for the Thalleioquin test. The test involves treating an aqueous or acidic solution of the alkaloid sample with bromine water until a faint yellow tint appears, followed by the addition of a few drops of concentrated ammonia solution.

Step 3: The formation of an emerald green color confirms a positive reaction for quinoline alkaloids that feature a methoxy group, such as quinine.

Step 4: Contrast with other color tests. The Vitali-Morin test detects tropane alkaloids (yielding a violet color); the Murexide test identifies purine bases like caffeine; the Shinoda test detects flavonoids in plant extracts.

Step 5: Therefore, the Thalleioquin test is the specific colorimetric assay for identifying Cinchona alkaloids.

Final Answer: Thalleioquin test

Answer: (A)

Go Back to Question 41

Q42.

Solution

Concept:

The central nervous system contains specialized regions within the brainstem that regulate autonomic homeostatic reflexes.

Solution:

Step 1: Review the divisions of the human brainstem: midbrain, pons, and medulla oblongata.

Step 2: Analyze the physiological role of the Medulla Oblongata. The medulla oblongata contains distinct networks of neurons that function as vital reflex centers for visceral homeostasis.

Step 3: These centers include the cardiovascular center (which regulates heart rate and stroke volume), the vasomotor center (which controls blood vessel diameter and blood pressure), and the respiratory centers (which set the basal rhythm of breathing).

Step 4: Contrast with other brain structures. The cerebellum coordinates voluntary skeletal muscle movements; the hypothalamus regulates temperature and endocrine pathways; the thalamus acts as a sensory relay station.

Step 5: Thus, the medulla oblongata is the primary brain structure responsible for regulating cardiovascular and respiratory reflexes.

Final Answer: Medulla oblongata

Answer: (B)

Go Back to Question 42

Q43.

Solution

Concept:

Hospital pharmacy procurement management utilizes structured purchasing workflows to manage inventory costs and ensure a reliable supply of medications.

Solution:

Step 1: Define the procurement process in institutional pharmacies. Large hospitals purchase pharmaceuticals in significant volumes, requiring structured mechanisms to secure competitive pricing.

Step 2: Understand the definition of Tendering. Tendering is a formal procurement procedure where a hospital pharmacy issues an open or restricted invitation to pharmaceutical manufacturers and suppliers to submit competitive price bids.

Step 3: These bids must meet specific quality criteria, packaging standards, and delivery timelines detailed in the tender document.

Step 4: After evaluating the submitted bids, the hospital administration awards the supply contract to the vendor providing the most favorable terms, typically the lowest cost that meets all quality metrics.

Step 5: Tendering does not involve selling damaged goods, direct emergency cash purchases, or stock verification via barcoding. Thus, it represents a formal invitation for competitive supply bids.

Final Answer: A formal invitation to suppliers to submit competitive bids for supplying medicines over a fixed duration

Answer: (B)

Go Back to Question 43

Q44.

Solution

Concept:

Cellular transport mechanisms are classified as passive or active based on their energy requirements and the direction of solute movement relative to electrochemical gradients.

Solution:

Step 1: Analyze transport mechanisms relative to concentration gradients. Movement down a concentration gradient is passive; movement against a gradient requires an input of energy.

Step 2: Define Primary Active Transport. This process utilizes specific transmembrane carrier proteins (pumps) to move solutes against their electrochemical gradient. It is powered directly by the hydrolysis of adenosine triphosphate (ATP).

Step 3: Review examples of primary active transport, such as the sodium-potassium pump (Na^+/K^+-ATPase), which pumps sodium ions out of the cell and potassium ions into the cell against their respective gradients.

Step 4: Contrast with other mechanisms. Facilitated diffusion is passive and moves solutes down a gradient using a carrier protein without expending ATP; simple diffusion occurs directly through the lipid bilayer; osmosis refers specifically to water movement.

Step 5: Therefore, transport against a gradient powered directly by ATP hydrolysis is classified as primary active transport.

Final Answer: Primary active transport

Answer: (B)

Go Back to Question 44

Q45.

Solution

Concept:

The Hydrophilic-Lipophilic Balance (HLB) scale is an empirical system that quantifies the amphiphilic nature of surface-active agents to guide surfactant selection in formulation design.

Solution:

Step 1: Review the structure of the HLB scale, which ranges from 0 to 20. Lower values indicate lipophilic properties; higher values indicate hydrophilic properties.

Step 2: Identify the application ranges along the HLB scale:

- HLB 1 – 3: Antifoaming agents
- HLB 3 – 6: Water-in-oil (w/o) emulsifying agents
- HLB 7 – 9: Wetting and spreading agents
- HLB 8 – 16: Oil-in-water (o/w) emulsifying agents
- HLB 13 – 15: Detergents
- HLB 16 – 18: Solubilizers

Step 3: The problem states that the surfactant has an HLB value of 14. This value falls within the 8 – 16 range, characterizing it as a hydrophilic surfactant.

Step 4: Hydrophilic surfactants partition preferentially into the aqueous phase, stabilizing oil droplets dispersed throughout a continuous water medium. This defines an oil-in-water (o/w) emulsifying agent.

Step 5: Therefore, a surfactant with an HLB value of 14 is classified as an oil-in-water (o/w) emulsifying agent.

Final Answer: Oil-in-water (o/w) emulsifying agent

Answer: (B)

Go Back to Question 45

Q46.

Solution

Concept:

The biosynthesis of thyroid hormones requires specific trace minerals to form the structural iodinated tyrosine rings of the active hormonal signaling molecules.

Solution:

Step 1: Identify the principal hormones secreted by the follicular cells of the thyroid gland: Thyroxine (T_4) and Triiodothyronine (T_3).

Step 2: Analyze the chemical structures of these hormones. Thyroxine is chemically designated as $3, 5, 3', 5'$-tetraiodothyronine, containing four iodine atoms; Triiodothyronine contains three iodine atoms.

Step 3: Trace the biosynthesis pathway. Follicular cells actively transport iodide ions (I^-) from the blood across their membrane via the sodium-iodide symporter. This iodide is oxidized and linked to tyrosine residues on thyroglobulin.

Step 4: Dietary iodine is essential for this pathway. Insufficient iodine intake can impair thyroid hormone synthesis, leading to compensatory thyroid hypertrophy, a clinical condition known as a goiter.

Step 5: Other trace elements like iron, zinc, or selenium serve as enzymatic cofactors in different pathways but are not structural components of thyroid hormones. Thus, iodine is correct.

Final Answer: Iodine

Answer: (B)

Go Back to Question 46

Q47.

Solution

Concept:

Management of drug-induced hepatotoxicity involves administering specific antidotes that replenish critical cellular antioxidant stores to neutralize reactive metabolic intermediates.

Solution:

Step 1: Analyze the metabolic pathway of paracetamol (acetaminophen). At therapeutic doses, it is primarily metabolized via glucuronidation and sulfation pathways. A small fraction is metabolized by CYP2E1 into a reactive, toxic intermediate called N-acetyl-p-benzoquinone imine (NAPQI).

Step 2: Understand the mechanism of toxicity in overdose. High doses of paracetamol saturate the primary pathways, shifting more metabolism toward CYP2E1 and generating excessive amounts of NAPQI. This toxic intermediate depletes hepatic glutathione stores and binds to cellular proteins, causing hepatic necrosis.

Step 3: Evaluate the mechanism of the antidote, N-acetylcysteine (NAC). NAC acts as a biochemical precursor that stimulates the synthesis of endogenous glutathione, restoring hepatic antioxidant capacity. It can also bind directly to free NAPQI, neutralizing its toxicity.

Step 4: Contrast with other antidotes. Atropine treats organophosphate poisoning; deferoxamine chelates iron; flumazenil reverses benzodiazepine toxicity.

Step 5: Therefore, N-acetylcysteine is the designated antidote for managing acute paracetamol overdose.

Final Answer: N-acetylcysteine

Answer: (B)

Go Back to Question 47

Q48.

Solution

Concept:

Cellular metabolic pathways are compartmentalized within specific sub-cellular organelles to optimize enzymatic efficiency and separate anabolic and catabolic processes.

Solution:

Step 1: Identify the intracellular locations of primary metabolic pathways. Glycolysis takes place entirely within the aqueous environment of the cytoplasm.

Step 2: Analyze the Citric Acid Cycle (also known as the Krebs Cycle or Tricarboxylic Acid Cycle). The enzymes responsible for the Krebs cycle are located within the fluid matrix of the mitochondria, except for succinate dehydrogenase, which is bound to the inner mitochondrial membrane.

Step 3: The Citric Acid Cycle oxidizes Acetyl-CoA derived from carbohydrates, lipids, and proteins into carbon dioxide (CO_2), generating reduced coenzymes (NADH and $FADH_2$) that drive the electron transport chain.

Step 4: Contrast with other pathways. The pentose phosphate pathway occurs in the cytosol; glycogenolysis takes place in the cytoplasm where glycogen particles are stored.

Step 5: Thus, the Citric Acid Cycle is the specific pathway localized within the mitochondrial matrix that serves as a final common oxidative pathway.

Final Answer: Citric Acid Cycle (Krebs Cycle)

Answer: (B)

Go Back to Question 48

Q49.

Solution

Concept:

Pharmacokinetic parameters describe the movement of a drug through the body, quantifying its absorption, distribution, metabolism, and excretion.

Solution:

Step 1: Define Bioavailability (F). Bioavailability describes the fraction of an administered dose of unchanged drug that reaches the systemic circulation intact, along with the rate at which this process occurs.

Step 2: Understand the factors that affect bioavailability. When a drug is given orally, its bioavailability can be reduced by incomplete gastrointestinal absorption or by first-pass metabolism in the intestinal wall and liver.

Step 3: Analyze the standard reference point. Intravenous administration bypasses all absorptive barriers, delivering the entire dose directly into the systemic blood supply. By definition, the bioavailability of an intravenous injection is 100% ($F = 1$).

Step 4: Contrast with other parameters. Volume of distribution describes drug distribution throughout body fluids; clearance describes the rate of drug elimination; plasma protein binding describes the fraction bound to albumin.

Step 5: Therefore, bioavailability refers specifically to the rate and relative extent to which an active drug moiety reaches the systemic circulation intact.

Final Answer: The rate and relative extent to which an active drug moiety reaches the systemic circulation intact

Answer: (B)

Go Back to Question 49

Q50.

Solution

Concept:

Pulmonary physiology utilizes surface-active agents within the alveoli to reduce surface tension at the air-liquid interface, maintaining alveolar stability.

Solution:

Step 1: Identify the cell types that comprise the alveolar epithelium: Type I alveolar cells (which form the structural wall for gas exchange) and Type II alveolar cells.

Step 2: Analyze the function of Type II alveolar cells (septal cells). These cuboidal epithelial cells synthesize and secrete pulmonary surfactant, a complex mixture of phospholipids (primarily dipalmitoylphosphatidylcholine) and proteins.

Step 3: Understand the role of pulmonary surfactant. It spreads as a thin layer over the aqueous fluid lining the internal alveolar surface, reducing surface tension.

Step 4: According to the Law of Laplace, reducing surface tension decreases the pressure required to keep small alveoli open, preventing their collapse (atelectasis) during expiration and reducing the overall work of breathing.

Step 5: Other components like alveolar macrophages handle phagocytosis, while ciliated cells are located in the upper conductive airways rather than the alveolar exchange surface. Thus, Type II cells are the correct answer.

Final Answer: Type II alveolar cells (Surfactant-producing)

Answer: (B)

Go Back to Question 50

Q51.

Solution

Concept:

Amino acids exist as dipolar ions known as zwitterions in aqueous solutions. The electrical charge distribution across the functional groups is fundamentally governed by the surrounding hydronium ion concentration.

Solution:

Step 1: Understand the structural behavior of amino acids. An amino acid possesses both a basic amino group ($-NH_2$) and an acidic carboxylic acid group ($-COOH$). At low pH, both groups are protonated, giving the molecule a net positive charge. At high pH, both groups lose protons, giving the molecule a net negative charge.

Step 2: Define the zwitterionic state. At a specific intermediate pH, the carboxylic acid group loses a proton ($-COO^-$) while the amino group remains protonated ($-NH_3^+$). This creates a dipolar ion with simultaneous positive and negative formal charges.

Step 3: Evaluate the net electrical charge of this zwitterion. Because the positive charge on the ammonium group balances the negative charge on the carboxylate group, the net overall electrical charge of the molecule is exactly zero.

Step 4: Analyze the behavior in an electric field. When subjected to zone electrophoresis, molecules with a net charge migrate toward the oppositely charged electrode. A molecule with zero net charge experiences no electrical force and remains stationary.

Step 5: Identify the quantitative term for this milestone. This specific pH value is defined as the Isoelectric point (pI). It differs from the dissociation constant (pK_a), which governs individual functional group ionization, and buffer capacity (β), which measures resistance to pH changes.

Final Answer: Isoelectric point (pI)

Answer: (B)

Go Back to Question 51

Q52.

Solution

Concept:

Glycosides are organic plant compounds consisting of a sugar moiety (glycone) bound to a non-sugar moiety (aglycone). They are classified based on the atom involved in the glycosidic linkage.

Solution:

Step 1: Understand the structural classification of glycosides. In O-glycosides, the glycone is attached to an oxygen atom of the aglycone. In S-glycosides, it links to a sulfur atom. In N-glycosides, it links to a nitrogen atom. In C-glycosides, the sugar is linked directly to a carbon atom of the aglycone.

Step 2: Analyze the chemical stability of C-glycosides. The carbon-carbon (C-C) bond linking the glycone and aglycone is significantly stronger and more chemically stable than the carbon-oxygen (C-O) ester or ether-like bonds found in O-glycosides.

Step 3: Evaluate the behavior during hydrolysis. Because the C-C bond is highly resistant to cleavage, C-glycosides do not break down under standard mineral acid or enzymatic hydrolysis. They require aggressive oxidative hydrolysis using reagents like ferric chloride ($FeCl_3$).

Step 4: Examine the given choices. Sennoside A is an O-glycoside found in senna; amygdalin is an O-linked cyanogenic glycoside; sinigrin is an S-linked glucosinolate found in mustard.

Step 5: Analyze the structure of Aloin. Aloin, the primary anthraquinone constituent isolated from *Aloe barbadensis*, features a glucose ring bound directly to the C-10 position of the anthrone aglycone. This structure classifies it as a classic, acid-resistant C-glycoside.

Final Answer: Aloin

Answer: (B)

Go Back to Question 52

Q53.

Solution

Concept:

Sterilization of pharmaceutical preparations can be achieved via thermal, chemical, radiation, or mechanical clearance protocols, depending on the chemical stability of the formulation.

Solution:

Step 1: Analyze the properties of the formulation. The ophthalmic solution is described as thermolabile and heat-sensitive. This rules out thermal sterilization methods like autoclaving or dry heat, which would degrade the active components.

Step 2: Evaluate the goal of the process. The factory must remove all viable vegetative microorganisms and fungal spores from the liquid to ensure sterility without exposing the formulation to thermal energy.

Step 3: Analyze the mechanism of sterilization by filtration. This mechanical technique physically traps and separates microbes from the liquid medium based on size exclusion rather than destroying them with heat or chemicals.

Step 4: Evaluate the specified filter options. A sintered glass filter disc with a pore size of 2 μm is too coarse and allows bacteria to pass through. Rotary vacuum drum filters and filter presses are industrial separation tools used for bulk slurries, not fine sterile manufacturing.

Step 5: Examine membrane filter discs. A membrane filter with a standardized pore size of 0.22 μm is small enough to retain all common vegetative bacterial cells (such as *Pseudomonas aeruginosa*). This makes it the standard choosing for cold sterilization of sterile ophthalmic and parenteral solutions.

Final Answer: Membrane filter disc (pore size 0.22 μm)

Answer: (B)

Go Back to Question 53

Q54.

Solution

Concept:

The statutory registration of professional pharmacists is regulated by State Pharmacy Councils to restrict the compounding and dispensing of medicines to qualified professionals.

Solution:

Step 1: Review the statutory provisions of Chapter IV of the Pharmacy Act 1948, which governs the preparation and maintenance of the official register of pharmacists.

Step 2: Understand the structure of the register. Each State Government constitutes a State Pharmacy Council responsible for preparing and maintaining a comprehensive ledger containing the names, addresses, and professional qualifications of registered pharmacists.

Step 3: Identify the steps of register compilation. The register initially compiled upon the inception of the Act is legally designated as the First Register. Qualified practitioners registered in subsequent phases are documented in the Subsequent Register.

Step 4: Analyze the legal authority granted by this registration. Only individuals whose names are actively maintained on this state ledger are recognized as registered pharmacists. They hold the exclusive legal authority to practice pharmacy, compound prescriptions, and dispense scheduled medicines within that state.

Step 5: Contrast with other options. The National Drug Formulary is a clinical guide; the Hospital Formulary is an institutional stock list; the Schedule H logbook is a retail record for prescription tracking. None of these serve as a registry of professional qualifications.

Final Answer: The First Register / Subsequent Register of Pharmacists

Answer: (B)

Go Back to Question 54

Q55.

Solution

Concept:

The autonomic nervous system (ANS) is divided anatomically and functionally into distinct divisions that coordinate involuntary visceral physiological processes.

Solution:

Step 1: Analyze the anatomical outflow of the autonomic nervous system. The preganglionic neurons of the sympathetic nervous system originate in the intermediolateral cell columns of the spinal cord segment spanning from the first thoracic vertebrae (T1) to the second or third lumbar vertebrae (L2-L3). This is known as the thoracolumbar outflow.

Step 2: Contrast this with the parasympathetic nervous system, which originates from cranial nerve nuclei (CN III, VII, IX, X) and sacral segments (S2-S4) of the spinal cord, known as the craniosacral outflow.

Step 3: Analyze the functional role of the sympathetic division. When an organism perceives an imminent physical threat or environmental stressor, the thoracolumbar outflow triggers widespread activation of the sympathetic nervous system.

Step 4: This coordinated activation initiates the classic "Fight-or-Flight" response. It induces physiological changes such as pupillary dilation (mydriasis), tachycardia, bronchodilation, glycogenolysis, and redistribution of blood flow from visceral organs to skeletal muscles.

Step 5: Therefore, the autonomic division characterized by thoracolumbar spinal outflow and responsible for mediating the flight-or-fight stress response is the sympathetic nervous system.

Final Answer: Sympathetic nervous system

Answer: (B)

Go Back to Question 55

Q56.

Solution

Concept:

The thermodynamic stability of colloidal dispersions and coarse suspensions depends on particle size distribution and the surface energy states of the system.

Solution:

Step 1: Understand the physical chemistry of small particles in a liquid medium. According to the Gibbs-Thomson equation, smaller particles possess higher surface energy and exhibit higher solubility in the surrounding solvent matrix than larger particles.

Step 2: Trace the concentration gradients that develop in the dispersion. Because smaller particles have higher solubility, a local concentration gradient forms around them. Solute molecules diffuse away from small particles and migrate toward the surfaces of larger, less soluble particles.

Step 3: Analyze the resulting structural changes. The dissolved solute deposits onto the surfaces of the larger particles, causing them to grow. Meanwhile, the smaller particles continue to dissolve until they disappear completely. This shifts the overall distribution toward larger average particle sizes over time.

Step 4: Identify the name of this thermodynamic phenomenon. This process is defined as Ostwald ripening. It represents a significant physical stability challenge for parenterals like iron dextran injections and nano-emulsions.

Step 5: Contrast with other stability terms. Flocculation involves reversible loose aggregation without changes in particle size; coalescence describes the irreversible merging of liquid droplets; phase inversion represents the flipping of an emulsion's continuous and dispersed phases.

Final Answer: Ostwald ripening

Answer: (B)

Go Back to Question 56

Q57.

Solution

Concept:

Alkyl halides undergo distinct organic reaction pathways depending on the chemical properties of the substrate, the strength of the base, and the nature of the reaction solvent.

Solution:

Step 1: Analyze the starting materials and reaction conditions. The substrate is an alkyl halide (such as bromoethane), and the reagent is potassium hydroxide (KOH) dissolved in an alcoholic solvent (typically ethanol), which generates ethoxide ions ($CH_3CH_2O^-$).

Step 2: Evaluate the chemical role of alcoholic potassium hydroxide. Ethoxide is a strong, sterically unhindered base. It acts primarily as a powerful Brønsted-Lowry base to abstract a proton rather than functioning as a nucleophile.

Step 3: Trace the reaction mechanism. The strong base attacks and abstracts a hydrogen atom from the beta-carbon (β-carbon) of the alkyl halide. Concurrently, the carbon-hydrogen (C-H) electron pair shifts to form a new carbon-carbon pi-bond (C=C), which triggers the simultaneous departure of the halide leaving group from the alpha-carbon (α-carbon).

Step 4: Determine the reaction kinetics and classification. Because the abstraction of the proton and the expulsion of the leaving group occur simultaneously in a single, concerted step, the rate-determining transition state depends on both the substrate and the base. This marks it as a Bimolecular Elimination (E2) pathway.

$$\text{R-CH}_2\text{-CH}_2\text{-X} + \text{OH}^- \xrightarrow{\text{Alcohol}} \text{R-CH=CH}_2 + \text{H}_2\text{O} + \text{X}^-$$

Step 5: The primary organic product generated via this elimination mechanism is an alkene. This distinguishes it from nucleophilic substitution (S_N2), which occurs in aqueous media to yield alcohols, and electrophilic addition, which involves adding reagents across an unsaturated double bond.

Final Answer: Elimination reaction (E2)

Answer: (B)

Go Back to Question 57

Q58.

Solution

Concept:

Beta-lactam antibiotics selectively disrupt bacterial cell proliferation by interfering with the structural integrity of the cell envelope without affecting eukaryotic host cells.

Solution:

Step 1: Identify the chemical family of Penicillin G. Penicillin G contains a central thiazolidine ring fused to a core four-membered beta-lactam ring. This reactive ring structure mimics the structural conformation of the acyl-D-alanyl-D-alanine terminus of nascent peptidoglycan strands.

Step 2: Trace the target site in the cell wall. During cell wall synthesis in actively replicating bacteria, transpeptidase enzymes (also called Penicillin-Binding Proteins or PBPs) cross-link glycan strands to form a rigid peptidoglycan layer.

Step 3: Understand the molecular inhibition mechanism. The beta-lactam ring of Penicillin G binds covalently to the active site serine residue of the transpeptidase enzyme. This irreversible acylation deactivates the enzyme and halts all cross-linking activities.

Step 4: Analyze the physiological consequence for the bacterial cell. The lack of cross-linking leaves the cell wall structurally weak. As the cell takes in water via osmosis, the weakened cell wall cannot withstand the high internal turgor pressure, leading to cell lysis and death. This makes the drug bactericidal.

Step 5: Contrast with other drug mechanisms. Macrolides and tetracyclines bind to ribosomal subunits to inhibit protein synthesis; polymyxins disrupt plasma membrane permeability; rifamycins block RNA polymerase. Thus, penicillin specifically targets cell wall peptidoglycan cross-linking.

Final Answer: Inhibition of transpeptidase enzymes to disrupt bacterial cell wall peptidoglycan synthesis

Answer: (B)

Go Back to Question 58

Q59.

Solution

Concept:

Public health frameworks prioritize primary health interventions by targeting specific demographic cohorts to improve population outcomes and reduce mortality.

Solution:

Step 1: Define the core mission of "Family Welfare" services. Family welfare programs focus on optimizing health outcomes for families through reproductive planning, maternal care, and pediatric interventions.

Step 2: Identify the primary components of these services. The foundational pillars include antenatal care (ANC) for pregnant women, safe delivery practices, postnatal monitoring, nutritional support, childhood immunizations, and family planning counseling.

Step 3: Evaluate the strategic objectives of these interventions. By optimizing maternal health and providing comprehensive childhood immunization, these programs work to reduce the maternal mortality ratio (MMR) and infant mortality rate (IMR).

Step 4: Analyze the incorrect choices. Environmental engineering covers industrial effluent treatment; veterinary public health handles livestock immunization; vector control units manage urban drainage systems.

Step 5: Therefore, maternal and child healthcare, alongside reproductive planning services, represents the true focus of public health family welfare programs.

Final Answer: Maternal and child healthcare, alongside reproductive planning services

Answer: (B)

Go Back to Question 59

Q60.

Solution

Concept:

Parenteral solutions must be isotonic with human blood plasma and extracellular fluids to prevent osmotic shifts across red blood cell membranes.

Solution:

Step 1: Understand the definition of an isotonic solution. An isotonic solution exerts the same osmotic pressure as plasma, preventing water from moving into or out of red blood cells.

Step 2: Determine the freezing point depression reference value. Human blood plasma freezes at approximately $-0.52^{\circ}C$. Any aqueous pharmaceutical formulation intended for intravenous injection must match this freezing point depression to be considered truly isotonic.

Step 3: Calculate the concentration of sodium chloride required to achieve isotonicity. Experimental data shows that an aqueous solution containing 0.90 g of sodium chloride (NaCl) dissolved in a total volume of 100 mL of water (0.90% w/v) lowers the freezing point of water to exactly $-0.52^{\circ}C$.

Step 4: Evaluate the clinical applications of this concentration. This preparation is commercially designated as Normal Saline or Isotonic Sodium Chloride Solution. It is used for intravascular volume expansion, fluid resuscitation, and drug reconstitution.

Step 5: Analyze the incorrect concentrations. A concentration of 0.45% w/v is hypotonic and can cause hemolysis; concentrations of 3.0% w/v and 5.0% w/v are hypertonic solutions used only for severe, acute hyponatremia. Thus, 0.90% w/v is the precise standard value.

Final Answer: 0.90% w/v

Answer: (B)

Go Back to Question 60

Q61.

Solution

Concept:

Clinical pathology utilizes specific serum organ function biomarkers to evaluate biochemical synthesis, organic clearance, and metabolic excretion pathways.

Solution:

Step 1: Define the biological origin of bilirubin. Bilirubin is a yellow-pigmented breakdown product of hemoglobin generated during the physiological destruction of senescent red blood cells by the reticuloendothelial system.

Step 2: Trace the hepatic pathway of bilirubin. Free, unconjugated bilirubin travels through the bloodstream bound to albumin and is absorbed by hepatocytes. The liver conjugates it with glucuronic acid, converting it into water-soluble conjugated bilirubin, which is excreted into the bile canaliculi.

Step 3: Analyze the diagnostic utility of measuring serum bilirubin. Elevated total or direct serum bilirubin levels indicate hepatic dysfunction, biliary tract obstruction, or hemolytic conditions, reflecting the liver's conjugation and excretory capacity.

Step 4: Evaluate the other options. Serum creatinine and blood urea nitrogen (BUN) are excretory products filtered by the glomerulus, serving as indicators of renal function. Glycated hemoglobin (HbA1c) monitors long-term blood glucose control in diabetic patients.

Step 5: Therefore, serum bilirubin is the specific biomarker used to evaluate the excretory and metabolic performance of the liver.

Final Answer: Serum Bilirubin level

Answer: (B)

Go Back to Question 61

Q62.

Solution

Concept:

Chemical bonds are formed by sharing, transferring, or interacting valence electrons between atomic nuclei to establish a stable electronic configuration.

Solution:

Step 1: Define the concept of a chemical bond. Atoms interact to achieve a stable octet configuration in their outermost valence electron shells.

Step 2: Analyze the mechanism of covalent bonding. A covalent bond forms when two non-metallic atoms with similar electronegativities share one or more pairs of valence electrons.

Step 3: Distinguish between equal and unequal sharing. When atoms have identical electronegativities (such as in H_2 or O_2), electrons are shared equally, forming a non-polar covalent bond. When electronegativities differ slightly (such as in H_2O), electrons are shared unequally, forming a polar covalent bond.

Step 4: Contrast with other bonding types. An ionic bond involves the complete electrostatic transfer of electrons from a metal to a non-metal. A hydrogen bond is a dipolar attraction between a hydrogen atom and a highly electronegative element like O, N, or F. Van der Waals interactions are weak transient forces.

Step 5: Thus, the sharing of valence electron pairs between non-metallic elements defines a covalent bond.

Final Answer: Covalent bond

Answer: (B)

Go Back to Question 62

Q63.

Solution

Concept:

Synovial joints are classified anatomically and mechanically based on the configuration of the articulating bone surfaces and the rotational degrees of freedom they allow.

Solution:

Step 1: Analyze the structural anatomy of a ball-and-socket synovial joint. This joint features a spherical or hemispherical head of one bone (the ball) that fits into a cup-like depression or cavity of an adjacent bone (the socket).

Step 2: Evaluate the degrees of freedom in this joint configuration. This geometric pairing functions as a multiaxial joint, allowing rotation around multiple spatial axes.

Step 3: Identify the movements permitted by this structure. It allows flexion, extension, abduction, adduction, medial rotation, lateral rotation, and circumduction. This provides the widest range of movement in the human body.

Step 4: Examine anatomical examples. The glenohumeral joint of the shoulder and the acetabulofemoral joint of the hip are classic ball-and-socket configurations.

Step 5: Compare with other joint types. A hinge joint (like the elbow) is uniaxial and permits movement in only one plane; a pivot joint allows only axial rotation; a suture joint is an immovable fibrous connection found in the skull. Thus, the ball-and-socket joint is the correct answer.

Final Answer: Ball-and-socket joint

Answer: (B)

Go Back to Question 63

Q64.

Solution

Concept:

Post-harvest handling of digitalis leaves requires rapid processing to prevent enzymatic degradation of primary cardiotonic glycosides.

Solution:

Step 1: Analyze the chemical composition of fresh digitalis leaves. Fresh leaves harvested from *Digitalis purpurea* contain unstable primary glycosides, such as Purpurea glycoside A and B, along with endogenous hydrolytic enzymes.

Step 2: Examine the factors that drive enzymatic degradation. If harvested leaves retain high moisture content or are dried too slowly at ambient temperatures, these co-existing hydrolytic enzymes remain active. They cleave terminal sugar units, degrading the primary glycosides.

Step 3: Determine the optimal temperature for enzyme inactivation. To halt this degradation, the active enzymes must be rapidly denatured. Heating the leaves to a temperature between 55°C and 60°C rapidly inactivates the enzymes without damaging the heat-sensitive cardiotonic glycosides.

Step 4: Evaluate the drying protocol. The leaves are placed in a temperature-controlled tray dryer immediately after harvesting to ensure rapid drying below 60°C. This preserves the primary therapeutic glycosides for pharmaceutical extraction.

Step 5: Analyze the incorrect choices. Slow drying at 20°C allows prolonged enzymatic breakdown; direct intense sunlight causes photolytic decomposition; washing with sulfuric acid degrades the structural integrity of the leaves.

Final Answer: Rapid drying of the leaves at a temperature below 60°C to inactivate enzymes

Answer: (B)

Go Back to Question 64

Q65.

Solution

Concept:

Antacids are inorganic alkaline compounds used to neutralize excess gastric hydrochloric acid. They are classified as systemic or non-systemic based on their solubility and absorption profiles.

Solution:

Step 1: Define systemic antacids. Systemic antacids are highly soluble in water, readily absorbable from the gastrointestinal tract, and enter the systemic circulation, where they can alter the acid-base balance of extracellular fluids.

Step 2: Analyze the chemical properties of Sodium Bicarbonate ($NaHCO_3$). Sodium bicarbonate is an inorganic compound that dissolves completely in gastric juices, reacting rapidly with hydrochloric acid (HCl):

$$NaHCO_3 + HCl \rightarrow NaCl + H_2O + CO_2$$

Step 3: Trace the systemic consequences of absorption. Because it is highly soluble, unreacted bicarbonate ions (HCO_3^-) are easily absorbed across the intestinal mucosa into the bloodstream. This excess alkalinizing power can cause systemic metabolic alkalosis.

Step 4: Analyze secondary side effects. The absorption of sodium ions (Na^+) expands extracellular fluid volume, leading to fluid retention and edema. This makes sodium bicarbonate unsuitable for long-term use, particularly in patients with hypertension or congestive heart failure.

Step 5: Compare with non-systemic antacids. Aluminum hydroxide, magnesium trisilicate, and calcium carbonate form insoluble compounds in the intestine. They are minimally absorbed and do not cause systemic alkalosis or fluid retention.

Final Answer: Sodium bicarbonate

Answer: (B)

Go Back to Question 65

Q66.

Solution

Concept:

The physical stability of emulsions relies on maintaining a uniform distribution of the dispersed liquid phase throughout the continuous phase against gravitational forces.

Solution:

Step 1: Understand the structure of an emulsion. An emulsion is a thermodynamically unstable system consisting of two immiscible liquid phases stabilized by an emulsifying agent.

Step 2: Trace the physical mechanism of creaming. Due to differences in density between the dispersed droplets and the continuous medium, the dispersed droplets tend to migrate over time under the influence of gravity.

Step 3: Analyze the direction of droplet movement. If the dispersed phase is less dense than the continuous phase (as in an oil-in-water emulsion), the droplets float upward, forming a concentrated layer at the top. If the dispersed phase is denser, the droplets sink, forming a layer at the bottom.

Step 4: Evaluate the reversibility of this process. Creaming is a physically reversible process. Because the protective surfactant film around individual droplets remains intact, the uniform distribution can be restored by gentle mechanical shaking.

Step 5: Contrast with other instability parameters. Cracking or coalescence involves the breaking of the surfactant film, leading to the irreversible merging of droplets into a separate phase; phase inversion involves the switching of the continuous and dispersed phases. Thus, reversible aggregation forming a concentrated layer is defined as creaming.

Final Answer: Creaming

Answer: (B)

Go Back to Question 66

Q67.

Solution

Concept:

Autonomic medications modulate synaptic transmission by acting as agonists or antagonists at specific neurotransmitter receptor sites across peripheral effector organs.

Solution:

Step 1: Identify the chemical nature of Atropine. Atropine is a tertiary amine alkaloid extracted from *Atropa belladonna* that acts as a prototypical competitive antagonist of acetylcholine.

Step 2: Trace its target receptor selectivity. The parasympathetic nervous system utilizes acetylcholine (ACh) as its terminal neurotransmitter, acting on nicotinic or muscarinic receptors. Atropine displays high selectivity for muscarinic acetylcholine receptors (M_1, M_2, M_3, M_4, M_5).

Step 3: Analyze the mechanism of competitive antagonism. Atropine binds to the orthosteric binding pocket of muscarinic receptors, sterically preventing the endogenous neurotransmitter acetylcholine from interacting with the receptor site. It possesses high binding affinity but lacks intrinsic efficacy.

Step 4: Determine the physiological outcomes. This blockade halts parasympathetic signaling, causing clinical effects such as decreased salivary secretions, mydriasis, cycloplegia, bronchodilation, and tachycardia (via blocking inhibitory M_2 receptors on the sinoatrial node).

Step 5: Evaluate the incorrect choices. Atropine does not stimulate nicotinic neuromuscular receptors, block alpha-1 adrenergic pathways, or inhibit acetylcholinesterase. It acts exclusively as a competitive muscarinic receptor antagonist.

Final Answer: Competitive antagonist at muscarinic acetylcholine receptors

Answer: (A)

Go Back to Question 67

Q68.

Solution

Concept:

Patient counseling in community pharmacy practice bridges clinical prescribing and safe, real-world medication adherence to optimize therapeutic outcomes.

Solution:

Step 1: Define the core purpose of patient counseling. Counseling involves personalized communication between a pharmacist and a patient regarding their dispensed prescription medications.

Step 2: Identify the critical topics covered during a counseling session. The pharmacist explains the exact purpose of the medication, the correct administration route, the prescribed dosage schedule, potential side effects, strategies to manage adverse events, and appropriate storage conditions.

Step 3: Understand the impact on patient safety. Proper counseling ensures the patient knows how to use their medication correctly, improves adherence, prevents dosing errors, and minimizes accidental drug inactivation due to improper storage.

Step 4: Analyze the incorrect choices. Patient counseling is not intended to explain retail profit margins, make clinical diagnoses (which is the physician's responsibility), or aggressively market expensive dietary supplements.

Step 5: Therefore, the primary objective of patient counseling is to ensure the patient fully understands how to take, schedule, and store their medication safely and effectively.

Final Answer: To ensure the patient understands the correct administration, dosage schedule, and storage of their medication

Answer: (B)

Go Back to Question 68

Q69.

Solution

Concept:

Heterocyclic chemistry classifies organic compounds based on the size of the ring structures, the number of heteroatoms, and the arrangement of fused rings in the molecular architecture.

Solution:

Step 1: Analyze the structural description given in the question. The molecule features a fused bicyclic ring matrix composed of an electron-dense six-membered aromatic benzene ring fused to a five-membered nitrogen-containing pyrrole ring.

Step 2: Evaluate the Indole nucleus. Indole, chemically designated as 1H-benzo[b]pyrrole, perfectly matches this structural description. The fusion occurs across the b face of the pyrrole ring, linking it to the benzene matrix.

Step 3: Review the structures of the other options. Quinoline features a benzene ring fused to a six-membered nitrogenous pyridine ring. Isoquinoline is a positional isomer where the nitrogen in the pyridine ring is at the 2-position. Purine consists of a six-membered pyrimidine ring fused to a five-membered imidazole ring, lacking a benzene ring entirely.

Step 4: Identify biological examples of indole rings. The indole nucleus is a key structural component in essential amino acids like tryptophan, neurotransmitters like serotonin (5-hydroxytryptamine), and plant alkaloids like reserpine and vincristine.

Step 5: Thus, the core fused heterocyclic core composed of a benzene ring and a pyrrole ring is definitively identified as Indole.

Final Answer: Indole

Answer: (B)

Go Back to Question 69

Q70.

Solution

Concept:

The Central Sterile Supply Department (CSSD) is a centralized internal hospital facility designed to control nosocomial infections by standardizing sterilization procedures.

Solution:

Step 1: Define the primary function of the CSSD in an institutional clinical facility. The CSSD processes, sanitizes, sterilizes, maintains, and distributes reusable medical instruments, surgical devices, and clinical goods.

Step 2: Trace the workflow within the department. The department receives contaminated equipment from operating theaters, emergency rooms, and wards. It cleans, disassembles, inspects, wraps, and sterilizes these items using high-volume autoclaves, ethylene oxide chambers, or dry heat ovens.

Step 3: Identify the sterile items processed. These include surgical instrument sets, laparoscopy tools, syringes, linens, wound gowns, and specialized dressings, ensuring they are safe for patient care.

Step 4: Evaluate the incorrect choices. The CSSD does not manage financial balance sheets, run educational seminars for interns, or compound non-sterile large-volume parenterals. Its focus is entirely on infection control through standardized sterilization.

Step 5: Therefore, the primary operational responsibility of the CSSD is procuring, sterilizing, and distributing medical instruments and surgical supplies.

Final Answer: Procuring and sterilizing medical instruments, dressings, and surgical goods for institutional use

Answer: (B)

Go Back to Question 70

Q71.

Solution

Concept:

Serological diagnostics identify infectious pathogens by detecting specific serum antibodies generated by the host immune response against bacterial antigens.

Solution:

Step 1: Identify the causative agent of enteric (typhoid) fever. Typhoid fever is a systemic infection caused by the Gram-negative bacterium *Salmonella enterica* serovar Typhi.

Step 2: Understand the principle of the Widal test. The Widal test is an immunodiagnostic tube or slide agglutination assay that detects specific agglutinating antibodies (O and H antibodies) present in the patient's serum sample starting in the second week of illness.

Step 3: Trace the agglutination reaction. The patient's serum is mixed with standardized suspensions of stained *Salmonella* antigens (O somatic antigen and H flagellar antigen). If homologous antibodies are present, they cross-link the antigens, creating visible macroscopic clumping or agglutination.

Step 4: Compare with other diagnostic tests. The Western Blot confirms HIV infections by separating viral proteins; ELISA assays quantify serum antigens or antibodies colorimetrically; the Mantoux skin test evaluates cellular immunity against *Mycobacterium tuberculosis*.

Step 5: Thus, the Widal test is the classic serological assay used to confirm a diagnosis of Enteric fever.

Final Answer: Widal test

Answer: (B)

Go Back to Question 71

Q72.

Solution

Concept:
Pharmaceutical packaging utilizes specialized glass types classified by their hydrolytic resistance and chemical composition to minimize interactions with liquid formulations.

Solution:
Step 1: Review the standard pharmacopoeial classifications for glass containers: Type I, Type II, Type III, and Type NP.

Step 2: Analyze the composition of Type I glass. Type I is a highly resistant borosilicate glass containing approximately 80% silica, 10% boric oxide, and small amounts of aluminum and sodium oxides.

Step 3: Evaluate its chemical resistance. The presence of boric oxide significantly reduces the expansion coefficient and enhances hydrolytic resistance, preventing the leaching of alkali oxides into aqueous solutions. This glass exhibits high thermal shock resistance and withstands repeated autoclaving cycles.

Step 4: Determine its primary application. Due to its superior chemical neutrality, Type I borosilicate glass is the preferred choice for packaging highly sensitive parenteral preparations, blood products, and aqueous injections.

Step 5: Compare with other glass types. Type II is a soda-lime glass surface-treated with sulfur dioxide to improve chemical resistance; Type III is a regular soda-lime glass with moderate hydrolytic resistance; Type NP is non-parenteral glass used only for oral or topical formulations. Thus, Type I is the correct answer.

Final Answer: Type I, Borosilicate glass

Answer: (A)

Go Back to Question 72

Q73.

Solution

Concept:

The elimination of xenobiotics requires enzymatic transformation pathways that alter the physical and chemical properties of lipid-soluble substances to facilitate renal excretion.

Solution:

Step 1: Understand the challenges of eliminating lipid-soluble drugs. Lipophilic compounds are easily absorbed across cellular membranes but are efficiently reabsorbed into systemic circulation by the renal tubules, preventing excretion in their native form.

Step 2: Define Hepatic Biotransformation. This metabolic process utilizes specialized liver enzyme networks to convert lipophilic drugs into more polar, water-soluble metabolites that are easily excreted in urine or bile.

Step 3: Analyze Phase I metabolism reactions. Phase I reactions introduce or expose functional groups ($-OH$, $-SH$, $-NH_2$) via oxidation, reduction, or hydrolysis, primarily driven by the cytochrome P450 monooxygenase enzyme family.

Step 4: Analyze Phase II metabolism reactions. Phase II reactions conjugate the drug or its Phase I metabolite with an endogenous polar molecule (such as glucuronic acid, sulfate, glycine, or glutathione), significantly increasing water solubility.

Step 5: Contrast with other excretion mechanisms. Renal glomerular filtration, biliary secretion, and pulmonary exhalation clear polar or volatile chemicals but rely on hepatic biotransformation to modify complex, lipid-soluble molecules first.

Final Answer: Hepatic biotransformation

Answer: (B)

Go Back to Question 73

Q74.

Solution

Concept:

The reproductive tract features specialized anatomical regions designed to support gamete transport, fertilization, zygote development, and gestational implantation.

Solution:

Step 1: Identify the components of the female reproductive system: the ovaries, fallopian tubes (oviducts), uterus, cervix, and vagina.

Step 2: Trace the path of gametes during reproduction. Following ovulation, the secondary oocyte is released from the ovarian follicle into the pelvic cavity and drawn into the infundibulum of the fallopian tube by fimbriae. Concurrently, ejaculated spermatozoa ascend through the cervical canal and uterine cavity into the fallopian tubes.

Step 3: Locate the site of fertilization. The fallopian tube is divided into four regions: the interstitial segment, isthmus, ampulla, and infundibulum. The ampulla is the widest, longest, thin-walled portion of the tube.

Step 4: Analyze the timing of fertilization. The ampulla serves as the normal anatomical site where spermatozoa meet and fertilize the secondary oocyte, forming a single-celled diploid zygote.

Step 5: Contrast with other structures. The endometrium of the uterus is the site for blastocyst implantation and embryonic development; the cervix acts as a selective barrier; the ovarian cortex is where follicles mature. Thus, fertilization occurs in the fallopian tube (ampulla).

Final Answer: Fallopian tube (Ampulla)

Answer: (B)

Go Back to Question 74

Q75.

Solution

Concept:

The commercial and legal evaluation of natural raw materials includes specific terminology to define purity, quality degradation, and fraudulent trade practices.

Solution:

Step 1: Define the core problem described. A pure, authentic crude drug sample is altered by adding a lower-grade, cheap, or completely inert substance, reducing its overall quality or therapeutic efficacy.

Step 2: Identify the scientific and legal term. This practice is defined as Adulteration. It encompasses the intentional or accidental substitution of genuine plant or animal matter with degraded, spurious, or morphologically similar foreign substances.

Step 3: Analyze the motivations and types of adulteration. Deliberate adulteration is often driven by financial profit, substituting expensive crude materials with cheaper alternatives (such as mixing exhausted clove buds with fresh cloves). Accidental adulteration can result from careless collection or improper storage.

Step 4: Compare with other quality-control terms. Evaluation refers to testing a drug's identity and purity; standardization involves establishing metrics to ensure uniform potency; cultivation is the systematic farming of medicinal plants.

Step 5: Therefore, adding inferior or spurious materials to a pure crude drug is defined as adulteration.

Final Answer: Adulteration

Answer: (B)

Go Back to Question 75

Q76.

Solution

Concept:

The chemical classification of carbohydrates as reducing or non-reducing sugars depends on the availability of functional groups to act as reducing agents in redox assays.

Solution:

Step 1: Define a reducing sugar. A reducing sugar is a carbohydrate that can act as a reducing agent in alkaline solutions, reacting with diagnostic reagents like Fehling's, Benedict's, or Tollens' solutions to reduce metal ions (Cu^{2+} to Cu^{+}, or Ag^{+} to Ag^{0}).

Step 2: Identify the structural requirement for this reactivity. For a carbohydrate to reduce these reagents, its ring structure must open in an aqueous environment to expose a free aldehyde or ketone carbonyl group.

Step 3: Locate this functional group on the sugar molecule. The free carbonyl group is located at the hemiacetal or hemiketal center, known as the anomeric carbon (C-1 for aldoses, C-2 for ketoses).

Step 4: Analyze the impact of glycosidic linkages. If the anomeric carbon is locked in a glycosidic bond (as seen in sucrose), the ring cannot open to expose the free carbonyl group, making it a non-reducing sugar. All monosaccharides (e.g., glucose, fructose) and some disaccharides (e.g., lactose, maltose) retain a free or potentially free anomeric group, classifying them as reducing sugars.

Step 5: Thus, the defining structural feature of a reducing sugar is the presence of a free or potentially free anomeric aldehyde or ketone group.

Final Answer: The presence of a free or potentially free anomeric aldehyde or ketone group

Answer: (A)

Go Back to Question 76

Q77.

Solution

Concept:

The choice of drug administration route determines the onset of action and bioavailability based on the physical and physiological barriers the drug must cross.

Solution:

Step 1: Define systemic bioavailability (F). Bioavailability represents the fraction of an administered drug dose that enters the systemic blood supply intact relative to an intravenous standard reference.

Step 2: Analyze the intravenous (IV) route. An intravenous injection delivers the entire drug dose directly into a systemic vein, bypassing all physiological absorption barriers like the intestinal wall or capillary membranes.

Step 3: Evaluate the impact of first-pass metabolism. Because the drug is injected directly into systemic circulation, it completely bypasses the liver's portal system. This prevents the immediate hepatic degradation known as first-pass metabolism, ensuring 100% of the active drug is bioavailable ($F = 1.0$).

Step 4: Compare with other injection routes. The intramuscular (IM) and subcutaneous (SC) routes require the drug to diffuse across muscle or adipose capillary endothelium into the blood. This can lead to incomplete or delayed absorption depending on local perfusion.

Step 5: Compare with the oral route. Oral administration exposes the drug to gastric degradation, variable intestinal absorption, and significant first-pass hepatic extraction, resulting in lower and more variable bioavailability. Thus, the intravenous route uniquely provides 100% bioavailability.

Final Answer: Intravenous route

Answer: (B)

Go Back to Question 77

Q78.

Solution

Concept:

Pharmaceutical formulation design utilizes specialized chemical excipients to maintain physical and chemical stability against environmental stressors.

Solution:

Step 1: Understand the impact of pH changes in a liquid formulation. Changes in pH can alter the ionization state of active pharmaceutical ingredients (APIs), reducing solubility, accelerating hydrolytic degradation, or causing chemical precipitation.

Step 2: Identify the role of buffer systems. Buffers are mixtures of a weak acid and its conjugate base (such as citric acid and sodium citrate) or a weak base and its conjugate acid. They are added to formulations to stabilize the pH.

Step 3: Analyze the chemical mechanism of buffering. When small amounts of hydronium ions (H_3O^+) are introduced, the conjugate base component neutralizes them. Conversely, when hydroxyl ions (OH^-) are introduced, the weak acid component neutralizes them. This minimizes overall shifts in pH.

$$HA + OH^- \rightleftharpoons A^- + H_2O \quad \text{and} \quad A^- + H^+ \rightleftharpoons HA$$

Step 4: Compare with other excipients. Surfactants modify surface tension to stabilize emulsions or enhance wetting; chelating agents bind trace heavy metals to prevent oxidation; preservatives inhibit microbial growth.

Step 5: Therefore, chemical agents added specifically to resist changes in hydronium ion concentration are defined as buffer systems.

Final Answer: Buffer systems

Answer: (B)

Go Back to Question 78

Q79.

Solution

Concept:

Autacoids, or local hormones, are biological signaling molecules synthesized on demand within tissues to mediate localized inflammatory and physiological responses.

Solution:

Step 1: Trace the biochemical origin of eicosanoids. Following physical tissue injury or chemical stimulation, phospholipase A_2 cleaves membrane phospholipids, liberating a 20-carbon polyunsaturated fatty acid known as arachidonic acid.

Step 2: Analyze the cyclooxygenase (COX) metabolic pathway. The arachidonic acid substrate can be processed via the cyclooxygenase ($COX-1$ and $COX-2$) enzymatic pathways, converting it into unstable endoperoxides (PGG_2 and PGH_2).

Step 3: Trace the synthesis of Prostaglandin E_2 (PGE_2). Downstream isomerases convert these endoperoxides into mature prostanoids, primarily Prostaglandin E_2.

Step 4: Evaluate the physiological actions of PGE_2. This autacoid induces local vasodilation, increases capillary permeability, and sensitizes peripheral nociceptors to pain mediators like bradykinin, acting as a primary driver of inflammation, pain, and fever.

Step 5: Compare with other inflammatory autacoids. Histamine is a preformed amine stored in mast cell granules; serotonin is derived from tryptophan; bradykinin is a peptide cleaved from plasma kininogens via the kallikrein pathway. None of these originate from arachidonic acid via the COX pathway. Thus, PGE_2 is the correct answer.

Final Answer: Prostaglandin E_2

Answer: (B)

Go Back to Question 79

Q80.

Solution

Concept:

Hospital clinical governance relies on an active Pharmacy and Therapeutics Committee (PTC) to optimize medication selection, safety, and inventory management.

Solution:

Step 1: Define the primary function of a Hospital Formulary system. A hospital formulary is an institutional clinical publication containing a selected list of therapeutic agents and medical devices approved for use within that healthcare facility.

Step 2: Trace the compilation and revision process. The formulary is compiled, evaluated, and continuously revised by the hospital's Pharmacy and Therapeutics Committee (PTC), which includes physicians, clinical pharmacists, and administrative staff.

Step 3: Analyze the selection criteria. Medications are chosen based on therapeutic efficacy, safety profiles, quality parameters, and cost-effectiveness. This prevents inventory duplication and ensures a consistent supply of core medications.

Step 4: Identify secondary information in the formulary. Beyond the list of approved drugs, it provides clinical guidelines, dosing protocols, administration rules, and policies for managing drug-use variations or unlisted items.

Step 5: Evaluate the incorrect choices. A hospital formulary is not a directory of industrial manufacturers, a patient billing file for insurance claims, or a regulatory manual for pharmacist salaries. It is an institutionally selected compilation of therapeutic agents.

Final Answer: A continuously revised compilation of pharmaceuticals selected by the medical staff for diagnostic and therapeutic utility in that hospital

Answer: (B)

Go Back to Question 80

Q81.

Solution

Concept:

Pharmacopoeial quality control uses standard limit tests to monitor and control trace chemical contaminants within acceptable purity tolerances.

Solution:

Step 1: Define a limit test in pharmaceutical analysis. A limit test is a quantitative or semi-quantitative assay designed to detect and control small trace amounts of inorganic impurities (such as chlorides, sulfates, iron, or heavy metals) that may remain in a chemical substance after manufacturing.

Step 2: Understand the visual mechanism of these tests. Most standard limit tests rely on a simple visual comparison. The turbidity, opalescence, or color generated in the test sample is compared directly against a control solution containing a known, permissible amount of the impurity.

Step 3: Evaluate the testing equipment. These visual comparisons are performed using matched glass cylinders known as Nessler cylinders, viewed under uniform lighting conditions against a consistent background.

Step 4: Analyze the testing standards. If the turbidity or color intensity of the test sample is less than or equal to that of the standard control, the sample passes the test, confirming the impurity is within official pharmacopoeial limits.

Step 5: Contrast with other analytical methods. A limit test is not a highly precise instrumental assay designed to measure absolute purity percentages, nor is it a destructive thermal test or a tool for molecular weight verification. It is a semi-quantitative test for trace impurities.

Final Answer: A semi-quantitative test designed to identify and control small traces of impurities within allowable specifications

Answer: (B)

Go Back to Question 81

Q82.

Solution

Concept:

Pharmacognosy classifies natural drugs into organized or unorganized categories based on their macroscopic cellular structure and processing methods.

Solution:

Step 1: Understand the definition of an unorganized drug. Unorganized drugs are natural substances derived from plants or animals through processing methods like incision, expression, extraction, or distillation. Unlike organized drugs, they lack a defined, cellular tissue matrix.

Step 2: Evaluate the physical forms of unorganized drugs. These substances are typically homogeneous solid, semi-solid, or liquid materials, including plant juices, exudates, latexes, gums, mucilages, fixed oils, and volatile essences.

Step 3: Analyze the choices provided. Digitalis leaves, clove buds, and senna leaflets are intact, cellular structures harvested directly from the plant. This characterizes them as organized drugs that can be identified via microscopic anatomy.

Step 4: Analyze the properties of Aloe. Aloe is the solid residue obtained by evaporating the liquid juice that flows spontaneously from incisions made at the base of *Aloe barbadensis* leaves. It is a dried plant juice that lacks cellular structures, classifying it as an unorganized drug.

Step 5: Therefore, Aloe is the correct example of an unorganized drug consisting of dried plant juice.

Final Answer: Aloe

Answer: (B)

Go Back to Question 82

Q83.

Solution

Concept:

The pH of a buffer system consisting of a weak acid and its conjugate base can be calculated using the Henderson-Hasselbalch equation, which correlates the pH with the acid dissociation constant and solute concentrations.

Solution:

Step 1: State the Henderson-Hasselbalch equation for a weak acid buffer system:

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

Step 2: Identify the given values from the problem statement. The acid dissociation constant exponent (pK_a) is 4.5, and the ratio of the concentration of the conjugate salt to the weak acid is exactly 10 : 1. This means:

$$\frac{[\text{Salt}]}{[\text{Acid}]} = 10$$

Step 3: Substitute these values into the Henderson-Hasselbalch equation:

$$\text{pH} = 4.5 + \log_{10}(10)$$

Step 4: Calculate the logarithmic term. The base-10 logarithm of 10 is exactly 1 ($\log_{10}(10) = 1$). Add this value to the pK_a:

$$\text{pH} = 4.5 + 1 = 5.5$$

Step 5: Verify the result. Adding a conjugate base to a weak acid shifts the pH upward into a less acidic range. The calculated pH of this buffer solution is exactly 5.5.

Final Answer: 5.5

Answer: (C)

Go Back to Question 83

Q84.

Solution

Concept:

Enzymes serve as highly specialized biological catalysts that accelerate the rates of cellular metabolic chemical reactions without being consumed in the process.

Solution:

Step 1: Analyze the energy barriers in chemical reactions. For a reactant to transform into a product, it must cross a specific energetic barrier known as the activation energy (E_a). This represents the energy required to reach a highly unstable transition state.

Step 2: Trace the physical mechanism of enzyme catalysis. An enzyme binds substrate molecules within its active site, forming an enzyme-substrate (ES) complex. This binding stabilizes the transition state through non-covalent interactions like hydrogen bonds and electrostatic forces.

Step 3: Determine the impact on activation energy. By stabilizing the transition state, the enzyme provides an alternative reaction pathway that significantly lowers the activation energy (E_a) compared to the uncatalyzed reaction. This lower barrier allows more molecules to react per unit time, accelerating the reaction rate.

Step 4: Analyze thermodynamic constants. While enzymes change the kinetics (rate) of a reaction, they do not alter its thermodynamics. They do not change the total free energy change (ΔG) or shift the final equilibrium position of a reversible reaction; they simply accelerate the rate at which equilibrium is reached.

Step 5: Therefore, the primary biochemical role of an enzyme is to lower the activation energy required for a chemical reaction to proceed.

Final Answer: To lower the activation energy required for the reaction to proceed

Answer: (B)

Go Back to Question 84

Q85.

Solution

Concept:
Diuretics are classified based on their primary site of action along the nephron and the specific solute transport systems they inhibit.

Solution:
Step 1: Identify the anatomical region specified. The thick ascending limb (TAL) of the loop of Henle is a water-impermeable segment responsible for reabsorbing approximately 25% of filtered sodium ions.

Step 2: Identify the primary transporter in this segment. The luminal membrane of epithelial cells in the TAL expresses a specialized electroneutral symporter: the sodium-potassium-two-chloride cotransporter, abbreviated as $Na^+/K^+/2Cl^-$.

Step 3: Analyze the mechanism of loop diuretics like Furosemide. Furosemide binds competitively to the chloride-binding sites of the $Na^+/K^+/2Cl^-$ cotransporter, completely blocking its transport activity.

Step 4: Determine the physiological outcome. Inhibiting this transporter prevents the reabsorption of sodium, potassium, and chloride ions. These solutes remain in the tubular fluid and travel downstream, creating an osmotic gradient that retains water within the lumen. This leads to a significant increase in urine output (diuresis).

Step 5: Compare with other diuretic classes. Hydrochlorothiazide inhibits the Na^+/Cl^- symporter in the distal tubule; spironolactone is an aldosterone antagonist acting in the collecting duct; acetazolamide is a carbonic anhydrase inhibitor acting in the proximal tubule. Thus, Furosemide is the correct loop diuretic.

Final Answer: Furosemide

Answer: (B)

Go Back to Question 85

Q86.

Solution

Concept:

The Drugs and Cosmetics Rules 1945 organize drugs into alphabetical schedules to apply specific regulatory standards for manufacturing, labeling, and retail sales.

Solution:

Step 1: Review the statutory definitions of the specified schedules within the text of the Act. The schedules classify medications based on their therapeutic utility and associated risks.

Step 2: Analyze Schedule C. Schedule C lists primary biological products, including parenterals, sera, toxins, antigens, antitoxins, and injectable biological formulations like insulin and vaccines.

Step 3: Analyze Schedule C1. Schedule C1 details non-parenteral special biological products, such as oral vitamins, digitalis preparations, ergot compounds, and specific antibiotics that require specialized regulatory oversight.

Step 4: Evaluate the regulatory requirements for these schedules. Manufacturing facilities producing Schedule C and C1 substances must adhere to strict quality standards, sterile manufacturing practices, and specialized storage protocols (such as continuous cold chain management).

Step 5: Compare with other schedules. Schedule G and H govern prescription-only drugs; Schedule X controls psychotropic and narcotic substances; Schedule J lists untreatable diseases; Schedule K details exemptions. Thus, biologicals like insulin, sera, and vaccines fall under Schedules C and C1.

Final Answer: Schedule C and C1

Answer: (B)

Go Back to Question 86

Q87.

Solution

Concept:

The primary structure of a protein is defined by a linear sequence of amino acids linked together by stable covalent bonds formed during translation.

Solution:

Step 1: Understand the structural components of an amino acid. Each amino acid possesses a primary alpha-amino group ($-NH_2$) and an alpha-carboxylic acid group ($-COOH$).

Step 2: Trace the condensation reaction that occurs during translation. A peptide bond forms when the alpha-carboxylate group of one amino acid reacts with the alpha-amino group of an adjacent amino acid. This condensation reaction eliminates one molecule of water (H_2O).

Step 3: Identify the resulting functional group. The combination of the carbonyl carbon from the carboxyl group and the nitrogen from the amino group forms a stable covalent amide linkage, structurally represented as $-CO\text{-}NH-$.

Step 4: Analyze the physical properties of this linkage. The peptide amide bond displays partial double-bond character due to resonance stabilization between the oxygen and nitrogen atoms. This restricts rotation around the bond axis, creating a rigid, planar backbone that supports secondary protein folding.

Step 5: Compare with other linkages. An ester linkage ($-CO\text{-}O-$) is found in lipids; an ether linkage ($-O-$) occurs in carbohydrates; disulfide bridges ($-S\text{-}S-$) stabilize tertiary protein structures. Therefore, a peptide bond is structurally classified as an amide linkage.

Final Answer: An amide linkage ($-CO\text{-}NH-$)

Answer: (B)

Go Back to Question 87

Q88.

Solution

Concept:
Industrial unit operations utilize distinct heat transfer mechanisms—conduction, convection, and radiation—depending on the physical state of the processing materials.

Solution:
Step 1: Analyze the physical configuration described. The process involves heat transfer through a solid metallic wall (such as stainless steel or copper) of a jacketed reaction vessel. High-pressure steam or hot fluid flows through the outer jacket to heat the contents inside.

Step 2: Define thermal conduction. Conduction is the transfer of thermal energy through a material without macroscopic movement of the matter itself. It occurs via microscopic atomic collisions and the movement of free electrons within the material matrix.

Step 3: Trace the flow of heat across the metallic wall. Kinetic energy from the hot fluid in the jacket is transferred to the atoms of the solid metal wall. These atoms vibrate and collide with neighboring atoms, transferring thermal energy across the solid wall to the inner surface of the vessel.

Step 4: Compare with other heat transfer mechanisms. Convection involves the macroscopic movement of fluid molecules (such as the mixing of liquids inside the vessel); radiation is the transfer of energy via electromagnetic waves through space without a physical medium.

Step 5: Therefore, heat transfer through a stationary, solid metallic structure occurs primarily via thermal conduction.

Final Answer: Conduction

Answer: (B)

Go Back to Question 88

Q89.

Solution

Concept:

The histomorphology of the digestive tract features specialized structural adaptations designed to optimize surface area and facilitate nutrient absorption.

Solution:

Step 1: Analyze the physiological requirements for nutrient absorption. The final breakdown products of digestion (monosaccharides, amino acids, fatty acids) must be efficiently transported across the intestinal epithelium into the blood and lymph networks. This process requires a significant surface area.

Step 2: Identify the macroscopic structural adaptations. The internal lining of the small intestine features circular folds of the mucosa and submucosa known as plicae circulares. These permanent folds force the chyme to spiral through the lumen, slowing its passage and increasing contact time.

Step 3: Identify the microscopic structural adaptations. The mucosal surface is covered with finger-like projections called villi, which project into the lumen. Each villus is lined with absorptive simple cuboidal or columnar epithelial cells (enterocytes) and contains a capillary network and a central lymphatic lacteal.

Step 4: Identify the sub-microscopic structural adaptations. The apical membrane of each individual enterocyte features a dense arrangement of microscopic cytoplasmic projections known as microvilli, which form a distinct brush border under a microscope. Together, these modifications increase the total absorptive surface area of the small intestine by more than 600-fold.

Step 5: Compare with other digestive organs. The stomach features temporary folds called rugae designed for expansion; the large intestine lacks villi and primarily reabsorbs water; the esophagus is lined with stratified squamous epithelium for protection. Thus, plicae circulares, villi, and microvilli are unique characteristics of the small intestine.

Final Answer: Small Intestine

Answer: (B)

Go Back to Question 89

Q90.

Solution

Concept:

The chemical degradation of pharmaceutical compounds in liquid solutions can proceed via multiple chemical pathways, including hydrolysis, oxidation, photolysis, or isomerization.

Solution:

Step 1: Analyze the degradation mechanism described. The chemical drug breaks down in solution due to the direct attack or presence of atmospheric molecular oxygen (O_2).

Step 2: Define chemical oxidation in formulation chemistry. Oxidation involves the loss of electrons from an atom or molecule, or an increase in its oxidation state. In liquid formulations, this process often proceeds via a free-radical chain mechanism called auto-oxidation.

Step 3: Trace the stages of auto-oxidation. The reaction begins with initiation (triggered by light, trace heavy metal catalysts, or thermal energy), which generates highly reactive free radicals. This is followed by propagation, where these radicals react with molecular oxygen to form peroxy radicals, which abstract hydrogen from other drug molecules, continuing the chain reaction.

Step 4: Identify susceptible functional groups. Formulations containing chemical groups such as phenols (e.g., adrenaline), catecholamines, conjugated double bonds (e.g., vitamin A), or thiols are highly susceptible to oxidative degradation, requiring the addition of antioxidants or nitrogen purging.

Step 5: Compare with other degradation pathways. Hydrolysis involves the cleavage of chemical bonds by water molecules; photolysis is degradation driven by light energy; isomerization involves a structural rearrangement without changing the molecular formula. Thus, degradation driven by atmospheric oxygen is classified as oxidation.

Final Answer: Oxidation

Answer: (B)

Go Back to Question 90

Q91.

Solution

Concept:

Herbal pharmacognosy classifies natural drugs based on their primary therapeutic actions and the chemical structure of their active secondary plant metabolites.

Solution:

Step 1: Define a cardiotonic agent. A cardiotonic agent is a substance that increases the force of myocardial contraction (positive inotropic effect) and optimizes cardiac output, making it useful for managing congestive heart failure (CHF).

Step 2: Identify the chemical class responsible for this cardiotonic action. The active constituents are steroidal glycosides, commonly known as cardiac glycosides. These molecules consist of a steroidal cyclopentanoperhydrophenanthrene core linked to an unsaturated lactone ring at C-17 and sugar moieties at C-3.

Step 3: Analyze the biological mechanism of action. These cardiac glycosides inhibit the transmembrane sodium-potassium adenosine triphosphatase ($Na^+/K^+ - ATPase$) enzyme pump in myocardial cells. This inhibition leads to an accumulation of intracellular sodium, which slows the sodium-calcium exchanger (NCX) and increases intracellular calcium ions (Ca^{2+}), strengthening myocardial contraction.

Step 4: Evaluate the given herbal drugs. Black pepper contains the alkaloid piperine; cinnamon contains cinnamic aldehyde volatile oil; ginger contains gingerols and volatile sesquiterpenes. None of these contain steroidal cardiac glycosides.

Step 5: Examine Digitalis. Digitalis, harvested from the dried leaves of *Digitalis purpurea*, contains high concentrations of cardiac glycosides like digitoxin and gitoxin. It is a classic natural herbal cardiotonic agent.

Final Answer: Digitalis

Answer: (B)

Go Back to Question 91

Q92.

Solution

Concept:

Organic functional groups are formed through condensation or substitution reactions between specific precursor structures under appropriate catalytic conditions.

Solution:

Step 1: Identify the reacting molecular species. The reactants are a carboxylic acid molecule (R-COOH) and an alcohol molecule (R'-OH).

Step 2: Analyze the reaction conditions. The transformation takes place under acidic conditions (typically catalyzed by concentrated sulfuric acid, H_2SO_4), which protonates the carbonyl oxygen of the carboxylic acid to increase its electrophilic reactivity.

Step 3: Trace the chemical mechanism, known as Fischer Esterification. The nucleophilic oxygen atom of the alcohol molecule attacks the activated electrophilic carbonyl carbon of the carboxylic acid, forming a tetrahedral intermediate.

Step 4: Trace the elimination step. A proton transfer occurs within the intermediate, turning the original hydroxyl group into a good leaving group (water). The subsequent reformation of the carbon-oxygen pi-bond drives the expulsion of the water molecule (H_2O).

$$\text{R-COOH} + \text{R'-OH} \xrightarrow{H^+} \text{R-COOR'} + H_2O$$

Step 5: Identify the final organic functional group. The resulting structural linkage features a carbonyl carbon bound to an ether-like oxygen atom (-COO-), which defines an Ester functional group. This distinguishes it from ethers (R-O-R'), anhydrides (R-CO-O-CO-R'), or ketones (R-CO-R').

Final Answer: Ester

Answer: (B)

Go Back to Question 92

Q93.

Solution

Concept:

The upper respiratory tract utilizes specialized structural materials to maintain airway patency against variations in air pressure during the respiratory cycle.

Solution:

Step 1: Understand the anatomical position and function of the trachea. The trachea is a flexible, tubular conduit that conducts atmospheric air between the larynx and the primary bronchi.

Step 2: Analyze the mechanical forces acting on the airway during respiration. During inhalation, expansion of the thoracic cavity creates negative intrapulmonary and intratracheal pressure. Without structural reinforcement, this suction force would cause the flexible tube to collapse, blocking airflow.

Step 3: Identify the structural reinforcement mechanism. The wall of the trachea is reinforced with a series of 16 to 20 transverse, rigid rings composed of hyaline cartilage. These structures provide the structural rigidity needed to keep the airway continuously open.

Step 4: Analyze the shape of these rings. These cartilage structures are C-shaped rather than complete circles. The open, posterior portion of the "C" faces the esophagus and is bridged by elastic fibroelastic tissue and the smooth trachealis muscle. This incomplete design allows the esophagus to expand forward during the swallowing of food boluses without obstruction.

Step 5: Therefore, C-shaped hyaline cartilage rings are the specific structures responsible for keeping the trachea patent and preventing its collapse.

Final Answer: C-shaped hyaline cartilage rings

Answer: (B)

Go Back to Question 93

Q94.

Solution

Concept:

Inorganic topical antimicrobials use oxidative mechanisms to destroy microbial structural components, providing non-specific antiseptic action upon tissue contact.

Solution:

Step 1: Understand the mechanism of oxidative antimicrobials. These agents act by liberating active oxygen species or free radicals that oxidize essential cellular macromolecules, including microbial proteins, lipids, and DNA, leading to cell death.

Step 2: Analyze the chemical properties of Hydrogen Peroxide (H_2O_2). Hydrogen peroxide is an inorganic peroxide formulation that is highly unstable when exposed to organic matter or catalytic enzymes.

Step 3: Trace the chemical reaction upon tissue contact. When applied to a wound, hydrogen peroxide interacts with the endogenous enzyme catalase present in human tissues and microbial cells. This enzyme rapidly catalyzes the decomposition of H_2O_2:

$$2H_2O_2 \xrightarrow{\text{Catalase}} 2H_2O + O_2 \text{ (Nascent / Molecular Oxygen)}$$

Step 4: Analyze the clinical effects. The rapid liberation of nascent oxygen produces a mechanical effervescent frothing that physically dislodges tissue debris and bacteria from the wound. Concurrently, the strong oxidizing properties of the liberated oxygen destroy anaerobic bacterial cells, acting as an effective topical antiseptic.

Step 5: Compare with other options. Sodium chloride is a systemic electrolyte; calcium hydroxide is a topical astringent; ammonium chloride functions as a systemic expectorant or acidifier. Thus, hydrogen peroxide is the correct oxidizing antimicrobial agent.

Final Answer: Hydrogen peroxide

Answer: (B)

Go Back to Question 94

Q95.

Solution

Concept:

Public health epidemiology classifies the transmission patterns of infectious diseases within human populations based on geographic distribution, prevalence timelines, and outbreak severity.

Solution:

Step 1: Define the epidemiological categories of disease occurrence: Endemic, Epidemic, Pandemic, and Sporadic.

Step 2: Define an Endemic disease state. A disease is considered endemic when it maintains a constant, predictable, and low-level presence within a specific geographic area or distinct population group over a prolonged duration (e.g., malaria in certain tropical zones). The disease remains habitual without requiring external reintroduction.

Step 3: Contrast with an Epidemic state. An epidemic occurs when the incidence of a disease rises significantly above normal expected levels within a localized population over a short period.

Step 4: Contrast with a Pandemic state. A pandemic represents an epidemic that has spread across multiple countries or continents, affecting a massive number of people globally (such as influenza pandemics). Sporadic diseases occur only occasionally and without a predictable geographic pattern.

Step 5: Therefore, the constant, habitual presence of an infectious agent within a specific geographic region is defined as endemic.

Final Answer: The constant, habitual presence of a disease or infectious agent within a specific geographic area or population group

Answer: (B)

Go Back to Question 95

Q96.

Solution

Concept:

Endocrine physiology classifies chemical signaling molecules based on their anatomical source, structural biochemistry, and therapeutic utility in metabolic regulation.

Solution:

Step 1: Identify the biological origin of insulin. Insulin is a specialized protein hormone synthesized, processed, and secreted by the beta cells (β-cells) located within the pancreatic islets of Langerhans.

Step 2: Analyze the structural biochemistry of insulin. Structurally, insulin is a peptide hormone composed of 51 amino acids arranged in two polypeptide chains: an A chain containing 21 amino acids and a B chain containing 30 amino acids. These chains are linked together by two interchain disulfide bonds.

Step 3: Determine its primary therapeutic classification. Insulin regulates carbohydrate, lipid, and protein metabolism. It binds to transmembrane tyrosine kinase insulin receptors on target cells (such as skeletal muscle and hepatocytes), stimulating glucose uptake and lowering blood glucose levels. This characterizes it as an antidiabetic peptide hormone.

Step 4: Evaluate the incorrect options. Insulin is an injectable peptide, not an oral biguanide (such as metformin); it lowers blood glucose levels, making it hypoglycemic rather than hyperglycemic like glucocorticoids; it functions as a systemic hormone, not a local digestive enzyme.

Step 5: Therefore, insulin is classified as an antidiabetic peptide hormone.

Final Answer: Antidiabetic peptide hormone

Answer: (B)

Go Back to Question 96

Q97.

Solution

Concept:

A medical prescription is a structured legal order composed of distinct, standardized anatomical sections that convey information to the dispensing pharmacist and the patient.

Solution:

Step 1: Review the structural components of a standard medical prescription: Superscription, Inscription, Subscription, and Signatura.

Step 2: Define the Superscription. The superscription consists of the classic symbol R_x, which stands for the Latin word *recipe*, meaning "take thou," and serves as a formal opening command.

Step 3: Define the Inscription. The inscription is the core body of the prescription, containing the specific names and quantities of the active pharmaceutical ingredients (APIs) and excipients.

Step 4: Define the Subscription. The subscription contains specific directions addressed directly to the dispensing pharmacist. These instructions specify the required pharmaceutical dosage form (such as tablets, capsules, ointments, or mixtures) and the total quantity of doses to be prepared and dispensed.

Step 5: Define the Signatura. The signatura (or signa) contains instructions directed to the patient, detailing the correct dose, administration frequency, and route of use. Thus, directions to the pharmacist are contained within the Subscription.

Final Answer: Subscription

Answer: (C)

Go Back to Question 97

Q98.

Solution

Concept:

The analytical evaluation of fixed lipids, fats, and waxes utilizes standardized chemical values to quantify chemical structures and identify adulteration.

Solution:

Step 1: Understand the source of free fatty acids in lipid samples. During storage, exposure to moisture and atmospheric conditions can cause hydrolytic degradation of triglycerides, releasing free fatty acids.

Step 2: Define the quantitative method for measuring acidity. The concentration of these free fatty acids is measured by neutralizing them with a standard alkaline solution, such as potassium hydroxide (KOH).

Step 3: State the definition of Acid Value. The acid value is officially defined as the number of milligrams of potassium hydroxide required to completely neutralize the free fatty acids present in exactly one gram of a fat or oil sample.

Step 4: Analyze the clinical and chemical significance. An elevated acid value indicates significant hydrolytic rancidity and degradation of the lipid sample. This index is used to evaluate the quality and freshness of fixed oils.

Step 5: Compare with other analytical values. Saponification value measures both free and esterified fatty acids to estimate molecular weight; iodine value quantifies the number of double bonds to measure unsaturation; hydroxyl value measures free hydroxyl groups. Thus, the neutralization of free fatty acids defines the acid value.

Final Answer: Acid Value

Answer: (B)

Go Back to Question 98

Q99.

Solution

Concept:

Centrally acting sedative-hypnotics produce a dose-dependent depression of the central nervous system by reinforcing endogenous inhibitory neurotransmission pathways.

Solution:

Step 1: Identify the primary inhibitory neurotransmitter in the mammalian central nervous system. Gamma-aminobutyric acid (GABA) is the principal inhibitory neurotransmitter, acting on ligand-gated ionotropic $GABA_A$ receptors.

Step 2: Trace the structural function of the $GABA_A$ receptor complex. Activation of the $GABA_A$ receptor opens an integral chloride ion (Cl^-) channel, allowing chloride ions to flow into the neuron. This influx causes hyperpolarization of the postsynaptic membrane, reducing neuronal excitability.

Step 3: Analyze the mechanism of action of Benzodiazepines, including Diazepam. Diazepam binds to a specific, high-affinity allosteric binding site located at the interface of the alpha and gamma subunits (α and γ) of the $GABA_A$ receptor complex.

Step 4: Determine the outcome of allosteric modulation. Diazepam binding does not directly open the channel; instead, it acts as a positive allosteric modulator that enhances the receptor's affinity for endogenous GABA. This increases the frequency of chloride channel opening cycles in response to GABA binding, reinforcing inhibitory neurotransmission and producing sedative, anxiolytic, and hypnotic effects.

Step 5: Compare with other options. Chlorpromazine is an antipsychotic that primarily blocks dopamine D_2 receptors; caffeine is a central stimulant that antagonizes adenosine receptors; morphine is an opioid analgesic that acts on μ-opioid receptors. Thus, Diazepam is the correct sedative-hypnotic.

Final Answer: Diazepam

Answer: (A)

Go Back to Question 99

Q100.

Solution

Concept:

Hospital pharmacy inventory management utilizes structured classification techniques to optimize stock investment, control storage expenditures, and avoid stockouts of critical items.

Solution:

Step 1: Define the problem of material management. A hospital pharmacy store stocks thousands of unique items, including medications, surgical goods, and diagnostics. Managing these items requires prioritizing stock control based on their clinical criticality.

Step 2: Define VED Analysis. VED analysis is an inventory management technique that classifies pharmaceuticals and supplies into three distinct categories based on their functional importance and the urgency of their clinical need: Vital (V), Essential (E), and Desirable (D).

Step 3: Analyze the Vital (V) category. Vital items are life-saving medications or critical antidotes (such as adrenaline, insulin, or anti-snake venom) that must be continuously stocked in the pharmacy. A stockout of these items could directly result in patient mortality.

Step 4: Analyze the Essential (E) and Desirable (D) categories. Essential items are medications used to manage serious illnesses (such as standard antibiotics or antihypertensives), where short-term stockouts can be tolerated for brief periods. Desirable items are medications used for minor or self-limiting conditions, where stockouts do not compromise acute patient safety.

Step 5: Compare with other inventory tools. ABC analysis classifies items based on cumulative annual consumption cost; FSN analysis categorizes items by consumption rate or turnover (Fast, Slow, Non-moving); the EOQ model calculates optimal order quantities to minimize total inventory costs. Thus, grouping by clinical criticality defines VED analysis.

Final Answer: VED Analysis

Answer: (B)

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Answer Key

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