DeepScience

Pharmaceutical Terminology - Vol. III

This Book is having 1200+ B. Pharm 3rd year (5th & 6th sem) all subjects terminologies and is beneficial for B. Pharm students, GPAT, NIPER, DI, Gov Pharmacist exam preparation etc.

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Mantra Publication

Pharmaceutical Terminology - Vol. III

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Preface

Pharmaceutical education is an ever-evolving discipline that demands clarity, precision, and conceptual understanding. The present book has been carefully compiled to serve as a comprehensive repository of terminologies covering all subjects of the Bachelor of Pharmacy (B. Pharm.) third year curriculum (5th & 6th semester). With over 1200+ terms, this book has been designed as a ready reference guide for pharmacy students to strengthen their foundational knowledge and gain conceptual clarity.

This work not only supports students pursuing their B. Pharm. degree, but also extends its usefulness to those preparing for various competitive and professional examinations, including GPAT, NIPER, Drug Inspector, Government Pharmacist, and other recruitment exams. The terminologies have been presented in a concise, systematic, and student-friendly manner, ensuring quick learning, easy recall, and long-term retention.

Our objective is to bridge the gap between theoretical learning and practical application by providing students with an effective tool for revision and self-assessment. The book is expected to serve as a companion resource that complements classroom learning and aids in competitive exam preparation.

We believe that this book will not only enhance the academic performance of students but also empower them to develop a deeper understanding of the pharmaceutical sciences and their practical relevance in healthcare and research. It is our sincere effort to make this book a one-stop solution for terminology-based learning in pharmacy. Each definition has been written with clarity to avoid ambiguity and confusion. The structured format ensures that students can use it both for academic studies and last-minute exam revisions. By consolidating vast subject matter into concise terms, we aim to reduce the burden of scattered learning. Ultimately, we hope this book inspires students to pursue pharmacy with confidence, curiosity, and commitment.

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The successful completion and publication of this book is the result of the collective support, encouragement, and guidance that we have been fortunate to receive throughout this academic endeavor. It gives us immense pleasure to acknowledge with gratitude all those who have directly or indirectly contributed to the realization of this work.

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We are deeply indebted to our **teachers, mentors, and academic guides**, whose knowledge and constructive suggestions have continually motivated us in the pursuit of excellence. We also extend our heartfelt thanks to our **colleagues and peers** from the pharmaceutical sciences fraternity, whose valuable feedback and insightful discussions enriched the content and ensured its relevance.

Special appreciation is due to our **students**, whose inquisitiveness and eagerness to learn have been the driving inspiration for compiling this book. We remain thankful to the **academic and research institutions, libraries, and digital platforms** that served as reliable sources of reference during the preparation of this manuscript.

Our deepest gratitude is reserved for our **families and well-wishers**, whose patience, understanding, and unwavering moral support provided us the confidence and determination to complete this book. Finally, we dedicate this book to the **entire pharmacy community—teachers, students, researchers, and practitioners—**whose tireless efforts continue to advance the frontiers of pharmaceutical education, research, and healthcare.

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SEM-V

BP501T. MEDICINAL CHEMISTRY– II (Theory)

1. **Histamine**

   A biologically active amine found in many tissues, histamine plays a role in allergic reactions, gastric acid secretion, and neurotransmission. It acts through four receptor types—H1, H2, H3, and H4—producing effects like smooth muscle contraction, vasodilation, and gastric acid release. Histamine is stored in mast cells and basophils, released during immune responses or tissue injury.

2. **H1 Receptor**

   H1 receptors are widely distributed in smooth muscle, endothelium, and the central nervous system. Their activation by histamine leads to allergic symptoms such as itching, swelling, bronchoconstriction, and vasodilation. They also play a role in wakefulness and nausea. Blocking H1 receptors with antihistamines helps in treating allergies, urticaria, motion sickness, and anaphylactic reactions.

3. **Diphenhydramine Hydrochloride**

   A first-generation H1 receptor antagonist with strong antihistaminic, antiemetic, and sedative effects. It is widely used for allergic conditions, motion sickness, insomnia, and cough due to its anticholinergic properties. Diphenhydramine crosses the blood–brain barrier, causing drowsiness, which is sometimes beneficial for short-term sleep aid but limits daytime use.

4. **Promethazine Hydrochloride**

   A phenothiazine derivative that acts as a potent H1 receptor antagonist with strong sedative, antiemetic, and anticholinergic effects. It is used for allergies, motion sickness, nausea, and preoperative sedation. Promethazine can cause drowsiness and dry mouth, and due to its sedative effect, it is sometimes used at night for symptomatic relief.

5. **Loratadine**

   A second-generation H1 receptor antagonist with minimal sedation. Loratadine is used for allergic rhinitis, conjunctivitis, and chronic urticaria. It has a long duration of action and does not significantly cross the blood–brain barrier, reducing the risk of drowsiness. It is preferred for daytime allergy control and is generally well-tolerated.

6. **Cimetidine**

   A selective H2 receptor antagonist that inhibits gastric acid secretion by blocking histamine action on parietal cells of the stomach. It is used in peptic ulcer disease, gastroesophageal reflux disease (GERD), and Zollinger–Ellison syndrome. Cimetidine can interact with cytochrome P450 enzymes, leading to drug interactions and endocrine side effects such as gynecomastia.

7. **Omeprazole**

   A proton pump inhibitor (PPI) that irreversibly blocks the H^+/K^+ ATPase enzyme in gastric parietal cells, suppressing acid production. It is used for GERD, peptic ulcers, and Zollinger–Ellison syndrome. Omeprazole provides longer-lasting acid suppression than H2 blockers and is taken before meals for maximum efficacy.

8. **Mechlorethamine**

   An alkylating agent used in chemotherapy, particularly for Hodgkin's disease. It forms cross-links in DNA, preventing replication and leading to cancer cell death. Mechlorethamine is highly toxic to rapidly dividing cells and may cause bone marrow suppression, nausea, and secondary malignancies. Due to its reactivity, it is given under strict medical supervision.

9. **Methotrexate**

   An antimetabolite and folic acid antagonist used in cancer chemotherapy, autoimmune diseases, and ectopic pregnancy. It inhibits dihydrofolate reductase, blocking DNA synthesis and cell replication. Methotrexate selectively targets rapidly dividing cells, but it can also harm normal tissues, causing side effects like bone marrow suppression, mucositis, and hepatotoxicity.

10. **Mercaptopurine**

    A purine analog antimetabolite used in leukemia treatment. It interferes with nucleotide synthesis, disrupting DNA and RNA production in rapidly dividing cells. Mercaptopurine is taken orally, and its dosage requires careful monitoring to avoid toxicity, including bone marrow suppression and liver damage. Genetic variations in metabolism can influence patient response.

11. **Dactinomycin**

    An antitumor antibiotic that binds DNA and inhibits RNA synthesis. It is effective

against various cancers, including Wilms' tumor, rhabdomyosarcoma, and gestational trophoblastic disease. Dactinomycin is highly potent but can cause severe toxicity, including bone marrow suppression and gastrointestinal disturbances. It is administered intravenously under strict oncological supervision.

12. **Vinblastine Sulphate**

    A plant-derived anticancer drug from *Catharanthus roseus*. Vinblastine inhibits microtubule formation, preventing cell division during mitosis. It is used to treat Hodgkin's lymphoma, breast cancer, and testicular cancer. Side effects include bone marrow suppression and neurotoxicity. Vinblastine is given intravenously and is part of combination chemotherapy regimens.

13. **Cisplatin**

    A platinum-based chemotherapy drug that forms DNA cross-links, inhibiting DNA synthesis and triggering apoptosis. Cisplatin is effective against testicular, ovarian, bladder, and lung cancers. Side effects include nephrotoxicity, ototoxicity, and severe nausea, which require preventive measures. Hydration therapy is often given to reduce kidney damage.

14. **Cromolyn Sodium**

    A mast cell stabilizer that prevents histamine and other inflammatory mediator release. It is used in allergic rhinitis, asthma, and conjunctivitis. Cromolyn is administered via nasal spray, eye drops, or inhaler. It is most effective when used prophylactically and has minimal systemic absorption, making it very safe.

15. **Famotidine**

    An H2 receptor antagonist that reduces gastric acid secretion. It is used in ulcers, GERD, and hypersecretory conditions. Famotidine has a longer duration of action and fewer drug interactions than cimetidine. It is well-tolerated, with rare side effects such as headache and dizziness.

16. **Ranitidine**

    An H2 receptor blocker formerly used for acid-related disorders. It reduced stomach acid production by blocking histamine's action on parietal cells. Due to contamination with NDMA, many formulations have been withdrawn. Before its recall, ranitidine was popular for peptic ulcer and GERD management with minimal sedation.

17. **Fluorouracil (5-FU)**

An antimetabolite chemotherapy drug that interferes with thymidylate synthase, blocking DNA synthesis. It is used for colorectal, breast, and skin cancers. 5-FU can be given intravenously or topically. Side effects include mucositis, bone marrow suppression, and hand-foot syndrome. Dose adjustment is needed in patients with enzyme deficiencies.

18. **Cyclophosphamide**

A nitrogen mustard alkylating agent used in cancers and autoimmune diseases. It cross-links DNA strands, preventing replication. Cyclophosphamide is a prodrug activated in the liver. Side effects include bone marrow suppression, hemorrhagic cystitis, and secondary cancers. Hydration and mesna are used to reduce bladder toxicity.

19. **Levocetirizine**

A third-generation non-sedating H1 receptor antagonist used for allergic rhinitis and chronic urticaria. It is the active enantiomer of cetirizine, offering potent symptom relief with minimal drowsiness. Levocetirizine has a rapid onset, long duration, and is generally safe, making it suitable for long-term allergy management.

20. **Azathioprine**

An immunosuppressive prodrug converted to mercaptopurine in the body. It inhibits purine synthesis, reducing immune cell proliferation. Azathioprine is used in organ transplantation, autoimmune disorders, and inflammatory bowel disease. Side effects include bone marrow suppression, hepatotoxicity, and increased infection risk, requiring regular blood monitoring during treatment.

21. **Amyl Nitrite**

A rapid-acting vasodilator used for relief of acute angina attacks. It relaxes vascular smooth muscle by releasing nitric oxide, leading to decreased myocardial oxygen demand. Administered by inhalation, its effects appear within seconds but last only a few minutes. It may cause headache, flushing, and reflex tachycardia.

22. **Nitroglycerin**

An organic nitrate that dilates veins and arteries by releasing nitric oxide, reducing cardiac preload and afterload. It is used in angina pectoris, heart failure, and hypertensive emergencies. Administered via sublingual, oral, or transdermal routes, nitroglycerin has a rapid onset. Common side effects include headache, flushing, and hypotension.

23. Isosorbide Dinitrate

A nitrate vasodilator that prevents and treats angina by reducing cardiac workload. It releases nitric oxide to relax vascular smooth muscles. Taken orally or sublingually, it has a longer duration than nitroglycerin but slower onset. Tolerance may develop, so dosing schedules often include nitrate-free intervals to maintain effectiveness.

24. Dipyridamole

A vasodilator and antiplatelet drug that increases adenosine levels, inhibiting platelet aggregation. Used in combination with other agents for stroke prevention and as a diagnostic aid in cardiac stress testing. It also dilates coronary vessels, improving blood flow. Side effects include dizziness, headache, and gastrointestinal upset.

25. Verapamil

A calcium channel blocker that reduces myocardial contractility and slows heart rate by blocking L-type calcium channels. It is effective in angina, hypertension, and supraventricular arrhythmias. Verapamil primarily acts on the heart, decreasing oxygen demand. Side effects include constipation, bradycardia, and hypotension.

26. Amlodipine

A long-acting dihydropyridine calcium channel blocker that causes vasodilation by inhibiting calcium influx into vascular smooth muscle. Used for hypertension and angina, it lowers blood pressure without significantly affecting heart rate. Side effects may include ankle swelling, flushing, and headache. It has a once-daily dosing schedule.

27. Nimodipine

A calcium channel blocker with high affinity for cerebral blood vessels, used to prevent vasospasm after subarachnoid hemorrhage. By relaxing cerebral arteries, it improves brain perfusion. Administered orally, it is well-absorbed and crosses the blood-brain barrier. Common side effects include hypotension and dizziness.

28. Acetazolamide

A carbonic anhydrase inhibitor diuretic that reduces bicarbonate reabsorption in the kidneys, leading to increased urine output. Used in glaucoma, altitude sickness, and certain forms of epilepsy. It can cause metabolic acidosis, hypokalemia, and paresthesia. Available in oral and injectable forms.

29. Chlorthiazide

A thiazide diuretic that inhibits sodium and chloride reabsorption in the distal tubules, increasing urine output. Used for hypertension, heart failure, and edema. It also reduces calcium excretion, helping in kidney stone prevention. Side effects include hypokalemia, hyperuricemia, and photosensitivity.

30. Furosemide

A potent loop diuretic that inhibits sodium, potassium, and chloride reabsorption in the loop of Henle. Used for rapid fluid removal in heart failure, pulmonary edema, and hypertension. It can cause electrolyte imbalances, dehydration, and ototoxicity. Administered orally or intravenously for quick effect.

31. Spironolactone

A potassium-sparing diuretic and aldosterone antagonist used in heart failure, hypertension, and hyperaldosteronism. It prevents sodium retention and potassium loss in the distal nephron. Side effects include hyperkalemia, gynecomastia, and menstrual irregularities. It has additional benefits in reducing heart remodeling.

32. Mannitol

An osmotic diuretic used to reduce intracranial and intraocular pressure. It increases osmotic pressure in the renal tubules, drawing water into the urine. Administered intravenously, it works rapidly. Common uses include cerebral edema and acute glaucoma. Side effects include dehydration and electrolyte disturbances.

33. Timolol

A non-selective beta-blocker used in glaucoma to reduce intraocular pressure and in hypertension and angina. It decreases heart rate and myocardial oxygen demand. In eye drop form, systemic effects are minimal, but oral use can cause bradycardia, hypotension, and bronchospasm.

34. Captopril

An ACE inhibitor that blocks the conversion of angiotensin I to angiotensin II, lowering blood pressure and reducing afterload in heart failure. It also slows progression of diabetic nephropathy. Side effects include cough, hyperkalemia, and rare angioedema. It has a short half-life, requiring multiple daily doses.

35. Lisinopril

A long-acting ACE inhibitor used for hypertension, heart failure, and post-myocardial infarction. It reduces vasoconstriction and sodium retention. Lisinopril is well-tolerated but can cause dry cough, hyperkalemia, and angioedema. It is taken once daily for sustained effect.

36. Clonidine

A centrally acting alpha-2 adrenergic agonist that reduces sympathetic outflow, lowering blood pressure. It is used for hypertension, ADHD, and withdrawal symptoms. Side effects include dry mouth, sedation, and rebound hypertension upon sudden withdrawal. Available in oral and transdermal forms.

37. Minoxidil

A direct vasodilator used for severe hypertension unresponsive to other drugs. It opens potassium channels in vascular smooth muscle, causing relaxation. It also stimulates hair growth, leading to its use in alopecia. Side effects include fluid retention, tachycardia, and hypertrichosis.

38. Sodium Nitroprusside

A potent vasodilator used in hypertensive emergencies and acute heart failure. It releases nitric oxide, relaxing both arteries and veins. Given by continuous intravenous infusion, it works within seconds but requires close monitoring due to risk of cyanide toxicity and severe hypotension.

39. Hydralazine

A direct arterial vasodilator used for hypertension and heart failure. It reduces afterload, improving cardiac output. Side effects include headache, flushing, tachycardia, and lupus-like syndrome. Often combined with beta-blockers and diuretics to minimize side effects and enhance therapeutic effect.

40. Reserpine

An antihypertensive that depletes norepinephrine and serotonin from nerve endings, reducing sympathetic tone. Rarely used today due to side effects like depression, nasal congestion, and gastrointestinal upset. It was one of the earliest effective oral treatments for hypertension but is now largely replaced by newer agents.

41. Quinidine Sulphate

A Class IA antiarrhythmic drug that blocks sodium channels, slowing conduction and prolonging the action potential. Used for atrial fibrillation, flutter, and ventricular arrhythmias. It also has mild anticholinergic effects. Side effects include cinchonism (tinnitus, dizziness), hypotension, and gastrointestinal upset. ECG monitoring is essential during therapy.

42. Procainamide Hydrochloride

A Class IA antiarrhythmic that slows cardiac conduction by blocking sodium channels and prolonging repolarization. It is used for atrial and ventricular arrhythmias, especially after myocardial infarction. Side effects include hypotension, lupus-like syndrome, and arrhythmia aggravation. Given orally or intravenously under close cardiac monitoring.

43. Disopyramide Phosphate

A Class IA antiarrhythmic with strong anticholinergic properties. It blocks sodium channels, slowing depolarization and prolonging the QT interval. Used for ventricular arrhythmias and hypertrophic cardiomyopathy. Side effects include dry mouth, constipation, urinary retention, and risk of torsades de pointes.

44. Phenytoin Sodium

An anticonvulsant with antiarrhythmic properties, classified as Class IB. It shortens the action potential duration, effective in treating digitalis-induced arrhythmias. Administered orally or intravenously, it requires monitoring due to narrow therapeutic index. Side effects include gum hyperplasia, nystagmus, and ataxia.

45. Lidocaine Hydrochloride

A Class IB antiarrhythmic and local anesthetic that blocks sodium channels, reducing excitability in ventricular myocardium. It is effective in acute ventricular arrhythmias, especially after myocardial infarction. Administered intravenously for arrhythmia control. Common side effects are CNS disturbances like tremors, confusion, and seizures.

46. Mexiletine Hydrochloride

An oral Class IB antiarrhythmic similar to lidocaine, used for ventricular arrhythmias. It blocks sodium channels, reducing excitability and conduction. Side effects include nausea, tremors, and dizziness. Often used for long-term suppression of ventricular tachycardia.

47. Amiodarone

A Class III antiarrhythmic that prolongs repolarization and refractory period by blocking potassium channels. Effective against supraventricular and ventricular arrhythmias. Side effects include pulmonary fibrosis, thyroid disorders, liver toxicity, and skin discoloration. Long half-life leads to prolonged action even after discontinuation.

48. Sotalol

A non-selective beta-blocker with Class III antiarrhythmic action. It prolongs cardiac repolarization and slows heart rate. Used for atrial fibrillation, ventricular tachycardia, and arrhythmia prophylaxis. Side effects include bradycardia, hypotension, and risk of torsades de pointes.

49. Clofibrate

A fibric acid derivative that lowers triglycerides and increases HDL cholesterol by activating peroxisome proliferator-activated receptor-alpha (PPAR-α). Used for hyperlipidemia. Side effects include gallstones, gastrointestinal upset, and muscle pain. It has largely been replaced by newer agents.

50. Lovastatin

A statin that inhibits HMG-CoA reductase, reducing cholesterol synthesis and increasing LDL receptor expression. Used for hypercholesterolemia and cardiovascular risk reduction. Side effects include liver enzyme elevation, muscle pain, and rare rhabdomyolysis. Taken at night for maximum effect.

51. Cholestyramine

A bile acid sequestrant that binds bile acids in the intestine, preventing reabsorption and promoting cholesterol breakdown. Used for hyperlipidemia and pruritus in biliary obstruction. Side effects include constipation, bloating, and interference with absorption of other drugs.

52. Cholestipol

A bile acid sequestrant similar to cholestyramine, used to lower LDL cholesterol. It binds bile acids in the gut, increasing their excretion. Side effects include gastrointestinal discomfort and reduced absorption of fat-soluble vitamins and some medications.

53. Menadione

A synthetic vitamin K analog used to treat hypoprothrombinemia and bleeding due to

vitamin K deficiency. It is necessary for synthesis of clotting factors II, VII, IX, and X. Side effects include flushing, dizziness, and hemolysis in G6PD-deficient patients.

54. Acetomenadione

A water-soluble vitamin K derivative used for prevention and treatment of bleeding disorders related to vitamin K deficiency. It helps in clotting factor synthesis in the liver. Side effects are rare but may include allergic reactions.

55. Warfarin

An oral anticoagulant that inhibits vitamin K epoxide reductase, reducing synthesis of clotting factors II, VII, IX, and X. Used for prevention of thromboembolism in atrial fibrillation, DVT, and mechanical heart valves. Requires INR monitoring. Side effects include bleeding and teratogenicity.

56. Clopidogrel

An antiplatelet drug that irreversibly inhibits the P2Y12 receptor on platelets, preventing ADP-mediated aggregation. Used in prevention of stroke, myocardial infarction, and stent thrombosis. Side effects include bleeding, gastrointestinal upset, and rare thrombotic thrombocytopenic purpura.

57. Digoxin

A cardiac glycoside that increases myocardial contractility by inhibiting Na^+/K^+-ATPase, increasing intracellular calcium. Used in heart failure and atrial fibrillation. Side effects include nausea, visual disturbances (yellow vision), and arrhythmias. Narrow therapeutic index requires serum level monitoring.

58. Digitoxin

Similar to digoxin, but more lipophilic with a longer half-life. It increases contractility and slows conduction through the AV node. Used in heart failure and certain arrhythmias. Side effects include gastrointestinal upset, arrhythmias, and visual disturbances.

59. Nesiritide

A recombinant form of human B-type natriuretic peptide used in acute decompensated heart failure. It promotes vasodilation, natriuresis, and diuresis, reducing cardiac preload and afterload. Side effects include hypotension and renal impairment.

60. Bosentan

An endothelin receptor antagonist used for pulmonary arterial hypertension. It causes vasodilation of pulmonary and systemic arteries by blocking endothelin-1. Side effects include liver toxicity, anemia, and edema. Regular liver function monitoring is required.

61. Testosterone

The primary male sex hormone responsible for development of male reproductive tissues, muscle mass, and secondary sexual characteristics. It is used in testosterone deficiency, delayed puberty, and certain cancers. Side effects include acne, mood changes, and cardiovascular risks. Available in injectable, transdermal, and oral forms.

62. Nandrolone

An anabolic steroid with high anabolic and low androgenic activity, used in anemia, osteoporosis, and muscle wasting disorders. It promotes protein synthesis and muscle growth. Long-term use may cause liver damage, hormonal imbalance, and cardiovascular issues. It is prohibited in sports due to doping regulations.

63. Progesterone

A natural female sex hormone essential for regulating the menstrual cycle, maintaining pregnancy, and preparing the uterus for implantation. Used in hormone replacement therapy, menstrual disorders, and contraception. Side effects include bloating, mood changes, and breast tenderness. Available in oral, injectable, and vaginal forms.

64. Oestriol

A naturally occurring estrogen with weaker activity compared to estradiol. It is used in hormone replacement therapy for menopausal symptoms and prevention of postmenopausal urinary tract issues. Side effects are generally mild but may include nausea, headache, and breast tenderness.

65. Oestradiol

The most potent natural estrogen in women, regulating menstrual cycle and reproductive function. Used in estrogen deficiency, contraception, and menopausal symptom relief. Side effects include nausea, weight changes, and increased risk of thromboembolism. Administered orally, transdermally, or by injection.

66. Oestrone

A weaker form of estrogen found in postmenopausal women. Used in hormone

replacement therapy to manage menopausal symptoms and osteoporosis. Side effects include headache, nausea, and cardiovascular risks with prolonged use. Available in oral and injectable forms.

67. Diethylstilbestrol

A synthetic nonsteroidal estrogen once used for pregnancy complications but now largely discontinued due to cancer risk in offspring. Rarely used for certain cancers. Side effects include nausea, gynecomastia in men, and high risk of reproductive tract abnormalities in exposed fetuses.

68. Sildenafil

A phosphodiesterase type 5 (PDE5) inhibitor used for erectile dysfunction and pulmonary hypertension. It enhances nitric oxide-mediated vasodilation in penile tissue. Side effects include headache, flushing, visual changes, and hypotension, especially with nitrates. Taken orally before sexual activity.

69. Tadalafil

A long-acting PDE5 inhibitor used for erectile dysfunction and benign prostatic hyperplasia. Duration of action can extend up to 36 hours. Side effects include headache, back pain, and flushing. It should not be used with nitrates due to severe hypotension risk.

70. Mifepristone

A progesterone receptor antagonist used for medical termination of pregnancy and as an emergency contraceptive. It blocks progesterone action, leading to detachment of the embryo. Side effects include cramping, bleeding, and nausea. Usually given with misoprostol for complete abortion.

71. Norgestrel

A synthetic progestin used in oral contraceptives and hormone replacement therapy. It prevents ovulation, thickens cervical mucus, and alters endometrial lining. Side effects include weight gain, mood changes, and menstrual irregularities.

72. Levonorgestrel

A potent synthetic progestin used in contraceptive pills and emergency contraception. It inhibits ovulation and prevents fertilization. Side effects include nausea, menstrual changes, and fatigue. Available in oral, implant, and intrauterine forms.

73. Cortisone

A corticosteroid with glucocorticoid activity, used in inflammation, allergies, and adrenal insufficiency. It reduces immune response and inflammation. Side effects include weight gain, osteoporosis, and hyperglycemia with long-term use.

74. Hydrocortisone

A natural glucocorticoid used in adrenal insufficiency, inflammation, and allergies. It has both glucocorticoid and mineralocorticoid activity. Side effects include fluid retention, hypertension, and suppression of adrenal function.

75. Prednisolone

A synthetic glucocorticoid with strong anti-inflammatory and immunosuppressive effects. Used in autoimmune diseases, allergies, and asthma. Side effects include hyperglycemia, osteoporosis, and Cushingoid appearance with prolonged use.

76. Betamethasone

A potent glucocorticoid with minimal mineralocorticoid activity. Used in severe inflammation, cerebral edema, and to accelerate fetal lung maturity in preterm labor. Side effects include immunosuppression and hormonal imbalances.

77. Dexamethasone

A highly potent long-acting glucocorticoid used in inflammation, cancer therapy, and cerebral edema. It has no mineralocorticoid activity. Side effects include adrenal suppression, hyperglycemia, and osteoporosis.

78. L-Thyroxine

A synthetic form of thyroxine (T4) used to treat hypothyroidism. It restores normal metabolism and energy levels. Side effects of overdosage include hyperthyroidism symptoms like palpitations, weight loss, and anxiety.

79. L-Thyronine

A synthetic form of triiodothyronine (T3) with faster onset than L-thyroxine. Used in severe hypothyroidism and myxedema coma. Side effects include tremors, insomnia, and tachycardia if overdosed.

80. Propylthiouracil

An antithyroid drug that inhibits thyroid hormone synthesis and conversion of T4 to T3.

Used in hyperthyroidism and thyroid storm. Side effects include rash, liver toxicity, and agranulocytosis.

81. Insulin

A peptide hormone produced by pancreatic β-cells that regulates glucose uptake and storage. Used in type 1 diabetes and advanced type 2 diabetes. Available in rapid, short, intermediate, and long-acting forms. Side effects include hypoglycemia, weight gain, and allergic reactions.

82. Tolbutamide

A first-generation sulfonylurea oral antidiabetic that stimulates pancreatic β-cells to release insulin. It has a short duration of action, making it safer for elderly patients. Side effects include hypoglycemia and weight gain. Its use has declined with newer agents.

83. Chlorpropamide

A long-acting first-generation sulfonylurea used for type 2 diabetes. It increases insulin secretion from pancreatic β-cells. Side effects include prolonged hypoglycemia, water retention, and flushing with alcohol. Caution is advised in elderly patients due to its long half-life.

84. Glipizide

A second-generation sulfonylurea that lowers blood glucose by stimulating insulin release. It has a shorter half-life than chlorpropamide, reducing prolonged hypoglycemia risk. Used in type 2 diabetes along with diet and exercise.

85. Glimepiride

A newer sulfonylurea with once-daily dosing and lower risk of hypoglycemia compared to older agents. It enhances insulin secretion and improves peripheral glucose utilization. Side effects include mild hypoglycemia and weight gain.

86. Metformin

A biguanide oral antidiabetic drug that decreases hepatic glucose production and increases insulin sensitivity. First-line therapy for type 2 diabetes. Side effects include gastrointestinal upset and rare lactic acidosis. It does not cause hypoglycemia or weight gain.

87. Pioglitazone

A thiazolidinedione that activates PPAR-γ receptors, improving insulin sensitivity in

adipose tissue, muscle, and liver. Used in type 2 diabetes. Side effects include weight gain, edema, and heart failure risk.

88. Rosiglitazone

Similar to pioglitazone, it enhances insulin sensitivity via PPAR-γ activation. Used in type 2 diabetes but associated with cardiovascular risk concerns. Side effects include fluid retention and increased fracture risk.

89. Repaglinide

A meglitinide that stimulates rapid, short-duration insulin release from pancreatic β-cells. Taken before meals to control postprandial glucose spikes. Side effects include hypoglycemia and weight gain.

90. Nateglinide

A rapid-acting meglitinide analog used for postprandial blood glucose control in type 2 diabetes. It stimulates insulin secretion and has a low risk of prolonged hypoglycemia.

91. Acarbose

An alpha-glucosidase inhibitor that delays carbohydrate digestion in the intestine, reducing postprandial hyperglycemia. Side effects include flatulence, diarrhea, and abdominal discomfort due to fermentation of undigested carbohydrates.

92. Voglibose

An alpha-glucosidase inhibitor similar to acarbose, used to reduce post-meal blood glucose levels. It has minimal systemic absorption, making it safe for long-term use, though gastrointestinal side effects are common.

93. Cocaine

A benzoic acid derivative local anesthetic that blocks sodium channels, preventing nerve conduction. It also has strong vasoconstrictive and CNS stimulant effects. Used in nasal surgeries. High abuse potential and cardiovascular toxicity limit its medical use.

94. Benzocaine

An amino benzoic acid derivative local anesthetic used topically for pain relief. It works by blocking sodium channels in nerve membranes. Overuse may cause methemoglobinemia, a rare but serious side effect.

95. Procaine

A short-acting amino benzoic acid derivative used in infiltration anesthesia. It blocks

sodium channels to prevent nerve impulse conduction. Side effects are rare but may include allergic reactions.

96. Lidocaine (Lignocaine)

An anilide derivative local anesthetic with rapid onset and intermediate duration. Used for local, regional, and topical anesthesia, as well as antiarrhythmic therapy. Side effects include CNS toxicity and cardiovascular depression at high doses.

97. Prilocaine

An amide-type local anesthetic with lower systemic toxicity than lidocaine. Commonly used in dental procedures. High doses may cause methemoglobinemia.

98. Dibucaine

A potent, long-acting local anesthetic used topically for pain and itching. It blocks sodium channels in nerve membranes. Overuse can cause systemic toxicity.

99. Tetracaine

A long-acting amino benzoic acid derivative used for spinal and topical anesthesia. It has a slow onset but provides prolonged anesthesia. Side effects include hypotension and CNS effects.

100. Phenacaine

A topical local anesthetic used in ophthalmology to relieve eye pain and discomfort during procedures. It works by blocking nerve conduction in the cornea. Side effects are rare but may include local irritation.

BP502 T. Industrial Pharmacy-I (Theory)

101. Preformulation Studies

An early phase in drug development aimed at understanding the physicochemical properties of a drug candidate. It helps in selecting suitable excipients, dosage form design, and predicting stability, bioavailability, and manufacturability.

102. Crystal Form

A solid state where molecules are arranged in a highly ordered lattice structure. Crystal form influences solubility, stability, and dissolution rate of a drug.

103. Amorphous Form

A non-crystalline solid state with random molecular arrangement. Amorphous drugs generally have higher solubility and dissolution rates but lower stability than crystalline forms.

104. Particle Size

The dimension of drug particles, affecting dissolution rate, bioavailability, and uniformity in dosage forms. Smaller particles dissolve faster due to increased surface area.

105. Particle Shape

The geometric form of drug particles, influencing flow properties, packing, and compressibility. Shapes may be spherical, needle-like, or irregular.

106. Flow Properties

Characteristics describing how powders move, crucial for capsule filling and tablet compression. Evaluated by angle of repose, bulk density, and Carr's index.

107. Solubility Profile

Assessment of a drug's solubility in various solvents across different pH values. Important for predicting absorption and selecting suitable dosage forms.

108. pKa

The pH at which a drug exists in 50% ionized and 50% unionized form. pKa influences solubility, absorption, and formulation pH requirements.

109. Partition Coefficient (Log P)

The ratio of a drug's solubility in a lipid phase to an aqueous phase. It indicates lipophilicity, predicting membrane permeability and absorption.

110. Polymorphism

The ability of a drug to exist in more than one crystalline form. Different polymorphs can vary in solubility, stability, and bioavailability.

111. Hydrolysis

A chemical degradation process where bonds break due to reaction with water. Common in esters and amides, leading to reduced drug stability.

112. Oxidation

A chemical reaction involving loss of electrons, often causing drug degradation. Prevented by antioxidants, inert atmospheres, and light-resistant packaging.

113. Reduction

A chemical reaction involving gain of electrons. Some drugs may undergo unwanted reduction, leading to inactive or toxic products.

114. Racemisation

Conversion of one optical isomer into its mirror image, potentially altering drug activity and safety.

115. Polymerization

A reaction where small molecules (monomers) combine to form larger chains (polymers), sometimes leading to drug instability.

116. BCS Classification

Biopharmaceutics Classification System categorizes drugs into four classes based on solubility and permeability, guiding formulation and regulatory strategies.

117. BCS Class I

High solubility and high permeability drugs. Usually have excellent bioavailability and minimal formulation challenges.

118. BCS Class II

Low solubility and high permeability drugs. Require solubility enhancement strategies like nanoparticles or solid dispersions.

119. BCS Class III

High solubility and low permeability drugs. Need permeability enhancement methods such as prodrugs or permeation enhancers.

120. Application of Preformulation Studies

Used to design optimal dosage forms, select excipients, predict stability, and ensure consistent drug performance in solid, liquid, and injectable products.

121. Tablet

A solid pharmaceutical dosage form containing a precise amount of drug with or without excipients, compressed or molded into shape.

122. Ideal Characteristics of Tablets

Should be uniform in weight, have adequate hardness, good mechanical strength, rapid disintegration (if uncoated), and acceptable appearance, while delivering the correct dose consistently.

123. Classification of Tablets

Tablets are classified as oral (e.g., chewable, sublingual, buccal), effervescent, delayed-release, controlled-release, vaginal, and diagnostic tablets based on their route and purpose.

124. Excipients

Inert ingredients added to formulations to aid manufacturing and performance, such as binders, disintegrants, lubricants, glidants, sweeteners, and coloring agents.

125. Granulation

A process of particle size enlargement to improve flow, compressibility, and uniformity in tablets. Can be wet granulation, dry granulation, or direct compression.

126. Wet Granulation

Mixing powders with a binder solution to form granules, followed by drying and screening. Improves tablet strength and uniformity.

127. Dry Granulation

Compacting powder blend without liquid, then milling into granules. Suitable for moisture-sensitive or heat-sensitive drugs.

128. Direct Compression

Compressing powder blends directly into tablets without granulation. Requires excellent flow and compressibility of ingredients.

129. Tablet Compression Problems

Common issues include capping (top breaking off), lamination (layer separation), sticking (material adhering to punches), and mottling (color variation).

130. Tablet Tooling

Refers to punches and dies used in tablet machines. Determines tablet shape, size, and embossing.

131. Tablet Coating

Applying a layer over a tablet for protection, taste masking, controlled release, or appearance. Types include sugar coating, film coating, and enteric coating.

132. Coating Materials

Include polymers (HPMC, CAP), plasticizers, pigments, and solvents, selected based on coating type and drug properties.

133. Coating Defects

Issues like picking, peeling, bridging, mottling, or orange peel effect can occur due to formulation or process faults.

134. In-Process Quality Control Tests

Tests performed during manufacturing, such as weight variation, hardness, friability, and disintegration, to ensure consistency.

135. Finished Product Tests

Include dissolution testing, content uniformity, assay, and appearance checks to ensure final quality.

136. Syrup

A concentrated aqueous solution of sugar containing medicinal substances, often flavored for palatability.

137. Elixir

A clear, sweetened hydro-alcoholic liquid containing active ingredients, used for drugs poorly soluble in water.

138. Suspension

A biphasic system containing solid drug particles dispersed in a liquid medium. Requires stabilizers to prevent settling.

139. Emulsion

A biphasic system where one liquid is dispersed in another immiscible liquid using emulsifying agents (oil-in-water or water-in-oil).

140. Evaluation of Liquid Orals

Includes viscosity, pH, sedimentation rate, redispersibility, microbial limits, and assay to ensure stability and uniformity.

141. Capsule

A solid dosage form in which drug substances are enclosed within a hard or soft soluble shell, usually made of gelatin, designed to mask taste, improve swallowing, and control drug release.

142. Hard Gelatin Capsule

Two-piece capsule made from gelatin and water, used to contain powders, granules, or pellets. Shells consist of a body and a cap.

143. Capsule Size

Capsules are available in standardized sizes (000 being largest, 5 being smallest), chosen based on drug dose and bulk density.

144. Capsule Shell Production

Made by dipping stainless steel pins into gelatin solution, drying, stripping, trimming, and joining to form uniform shells.

145. Filling of Hard Capsules

Drug powder or granules are filled into shells by hand filling, tamping, auger, or dosing disc machines in manufacturing.

146. Special Formulation Techniques

Include coating to modify release, banding to prevent tampering, and incorporating pellets for controlled drug delivery.

147. Manufacturing Defects in Capsules

Common defects include telescoping (cap slips over body), dented ends, split shells, and improper fill weights.

148. In-Process Quality Control (Capsules)

Includes checks for shell integrity, moisture content, weight variation, fill uniformity, and shell thickness during production.

149. Final Product Tests for Capsules

Dissolution, disintegration, content uniformity, moisture content, microbial testing, and assay of active drug.

150. Soft Gelatin Capsule

One-piece hermetically sealed capsule with a gelatin shell containing liquid or semi-solid fill, used for oils, vitamins, and poorly soluble drugs.

151. Nature of Shell (Soft Gelatin)

Shell contains gelatin, water, plasticizers (glycerin or sorbitol) and sometimes colorants, making it soft, flexible, and airtight.

152. Base Adsorption Factor

A measure of how much liquid a base can absorb without changing flow or sealing properties, important for accurate filling.

153. Minim/Gram Factor

Indicates the weight of a liquid fill per capsule volume; helps determine capsule size for specific liquid drug formulations.

154. Soft Gelatin Capsule Production

Prepared using rotary die process, plate process, or bubble method, where fill material and shell are formed simultaneously.

155. Soft Capsule Quality Control

Includes weight variation, leak tests, disintegration, dissolution, microbial testing, and shell thickness measurement.

156. Packing of Capsules

Capsules are packed in blister packs, strip packs, or bottles with desiccants to protect from moisture and damage.

157. Storage Conditions

Capsules are stored in cool, dry places to prevent shell deformation, stickiness, or brittleness due to moisture changes.

158. Stability Testing

Capsules are subjected to accelerated and real-time stability studies to check for drug potency, shell integrity, and moisture absorption over time.

159. Pellet

Small, free-flowing, spherical or semi-spherical particles containing drug and excipients, designed for modified or controlled release.

160. Pelletization Process

Includes layering, powdering, extrusion-spheronization, or hot-melt techniques; equipment includes spheronizers, fluid bed coaters, and extrusion devices.

161. Parenteral Products

Sterile dosage forms administered by injection through routes such as intravenous, intramuscular, or subcutaneous, bypassing the gastrointestinal tract for rapid and targeted drug delivery.

162. Types of Parenterals

Include small-volume parenterals (≤100 mL) like injections and large-volume parenterals (>100 mL) such as infusion fluids, along with sterile powders and lyophilized products.

163. Advantages of Parenterals

Provide rapid onset, bypass first-pass metabolism, suitable for unconscious patients, and deliver precise drug amounts directly into systemic circulation.

164. Limitations of Parenterals

Require trained personnel, strict sterility, specialized equipment, higher cost, and carry risks like infection, pain, and irreversible administration errors.

165. Preformulation Factors (Parenterals)

Include solubility, stability, pH, isotonicity, compatibility with excipients, and avoidance of particulate matter to ensure safety and efficacy.

166. Essential Requirements (Parenterals)

Must be sterile, pyrogen-free, isotonic, stable, particulate-free, and prepared in controlled environments following aseptic techniques.

167. Vehicles (Parenterals)

The solvent or medium used for drug delivery, commonly water for injection, but may also include oils or co-solvent systems.

168. Additives (Parenterals)

Substances added to improve stability or compatibility, such as buffers, antioxidants, preservatives, and chelating agents.

169. Isotonicity

Refers to matching the osmotic pressure of body fluids to prevent tissue irritation or hemolysis during administration.

170. Aseptic Processing

A manufacturing method where sterilized drug and components are assembled in a sterile environment to avoid contamination.

171. Lyophilization

Freeze-drying process that removes water from a solution to form a stable powder, extending shelf life of heat-sensitive drugs.

172. Large Volume Parenterals (LVPs)

Sterile solutions exceeding 100 mL, often used for hydration, electrolyte balance, or nutritional support, supplied in flexible bags or bottles.

173. Containers (Parenterals)

Include glass ampoules, vials, and plastic infusion bottles or bags, selected based on compatibility, stability, and barrier properties.

174. Closures (Parenterals)

Rubber stoppers or seals that maintain sterility and allow safe needle penetration without leakage or contamination.

175. Ampoules

Small, sealed glass containers holding a single dose of sterile liquid drug, opened by snapping the neck.

176. Vials

Multi-dose or single-dose glass containers with rubber closures, designed for reconstitution or repeated withdrawals.

177. Quality Control Tests (Parenterals)

Include sterility, pyrogen testing, particulate matter check, pH measurement, and assay of active ingredient.

178. Ophthalmic Preparations

Sterile dosage forms designed for application to the eye, including eye drops, ointments, and lotions.

179. Formulation Considerations (Ophthalmics)

Must be sterile, isotonic, buffered, non-irritating, and free from particulates, with pH close to tears (~7.4).

180. Eye Drop Preparation

Aqueous sterile solutions administered topically, prepared under aseptic conditions, preserved, and packaged in dropper bottles for accurate dosing.

181. Lipsticks

Solid cosmetic preparations applied to the lips for color, protection, and aesthetic appeal. They are formulated with waxes, oils, pigments, and emollients, ensuring smooth application, stability, and resistance to smudging. Quality checks include melting point, breaking strength, and color dispersion.

182. Shampoos

Hair cleansing preparations containing surfactants, conditioning agents, fragrances, and preservatives. They remove dirt, oil, and debris while maintaining scalp health. Types include medicated, anti-dandruff, and herbal shampoos. pH is maintained around 5–7 to prevent scalp irritation and hair damage.

183. Cold Cream

An emulsion of oil-in-water type designed for skin cleansing and moisturizing. Contains waxes, mineral oil, and borax, providing a cooling effect and deep skin hydration. Commonly used as a makeup remover and for dry skin treatment.

184. Vanishing Cream

An oil-in-water emulsion containing stearic acid, which leaves a non-greasy, invisible film after application. Provides skin softening, mild protection, and acts as a base for makeup. Often contains humectants and mild fragrances.

185. Toothpaste

A semi-solid preparation containing abrasives, fluoride, detergents, and flavoring agents, used for cleaning teeth, preventing dental caries, and freshening breath. Must have appropriate consistency, pH neutrality, and stability during storage.

186. Hair Dyes

Preparations used to alter hair color, either temporary, semi-permanent, or permanent.

Formulated with colorants, oxidizing agents (like hydrogen peroxide), and conditioning bases. Safety and patch tests are essential to prevent allergic reactions.

187. Sunscreens

Topical products containing UV filters that protect skin from harmful UVA and UVB radiation. Active agents may include zinc oxide, titanium dioxide, or chemical absorbers like oxybenzone. Labeled with SPF value for efficacy.

188. Pharmaceutical Aerosols

Pressurized dosage forms containing active ingredients, propellants, and solvents, dispensed through a valve system. Provide uniform, metered doses and are used in topical, respiratory, and cosmetic applications.

189. Propellants

Liquefied or compressed gases that expel aerosol contents. Examples include hydrocarbons (propane, butane) and fluorocarbons. They must be non-toxic, stable, and compatible with the formulation and container.

190. Aerosol Containers

Specially designed metal or glass cans capable of withstanding internal pressure without leakage. Must be corrosion-resistant, light-protective, and tamper-proof.

191. Aerosol Valves

Precision-engineered components controlling the release of aerosol formulation. Types include continuous spray, metered dose, and foam valves, selected based on product requirements.

192. Types of Aerosol Systems

Include two-phase (liquid propellant + vapor phase) and three-phase (liquid propellant + product concentrate + vapor). Selection depends on drug solubility and delivery needs.

193. Aerosol Formulation

Combines active drug, solvent, stabilizers, and propellant to ensure consistent delivery, stability, and patient acceptability. Manufacturing follows GMP and pressure safety guidelines.

194. Aerosol Evaluation

Involves checking valve function, spray pattern, particle size distribution, leak testing, pressure checks, and dose uniformity to ensure quality.

195. Aerosol Quality Control

Includes weight variation, valve crimping integrity, discharge rate, and container-pressure resistance testing, ensuring safety during storage and use.

196. Packaging Materials (Pharma)

Materials such as glass, plastics, metals, and laminates used to enclose and protect pharmaceutical products from environmental and mechanical damage.

197. Choice of Containers

Influenced by product stability, moisture sensitivity, light protection needs, compatibility, cost, and regulatory requirements.

198. Legal Requirements for Containers

Must comply with pharmacopoeial standards, labeling laws, tamper-evident features, and safety regulations to ensure public health protection.

199. Stability of Packaging Materials

Assessed to ensure they do not interact chemically or physically with the product, maintaining drug potency, safety, and appearance over shelf life.

200. Packaging Quality Control Tests

Include dimensional accuracy, closure integrity, drop tests, leak-proofing, chemical compatibility, and light transmission evaluation.

BP503.T. PHARMACOLOGY-II (Theory)

201. Hemodynamics

The study of blood flow and the forces involved in circulation within the cardiovascular system. It includes parameters like cardiac output, blood pressure, systemic vascular resistance, and venous return. Hemodynamic principles guide the understanding of drug effects on heart function, vessel tone, and tissue perfusion.

202. Electrophysiology of Heart

Examines the generation and conduction of electrical impulses in the heart. Involves structures like the SA node, AV node, bundle branches, and Purkinje fibers. Understanding this helps in managing arrhythmias with drugs affecting depolarization and repolarization.

203. Congestive Heart Failure (CHF)

A chronic condition where the heart cannot pump enough blood to meet body needs. Common causes include hypertension, coronary artery disease, and valvular disorders. Drug therapy improves contractility, reduces preload/afterload, and prevents disease progression.

204. Cardiac Glycosides

A drug class, including digoxin, used in CHF to increase myocardial contractility by inhibiting Na^+/K^+-ATPase. This increases intracellular calcium, improving heart output but requiring careful monitoring due to narrow therapeutic index.

205. Diuretics in CHF

Drugs like furosemide reduce fluid overload by increasing urine output, lowering preload, and improving symptoms like edema and breathlessness in heart failure patients.

206. ACE Inhibitors

Medications such as enalapril reduce afterload and preload by blocking conversion of angiotensin I to angiotensin II, leading to vasodilation and decreased aldosterone secretion. Widely used in hypertension and CHF.

207. Beta Blockers in CHF

Agents like carvedilol reduce sympathetic overactivity, slow heart rate, and improve ventricular filling. They also prevent disease progression in chronic heart failure.

208. Anti-hypertensive Drugs

A group of medications that lower high blood pressure to reduce the risk of stroke, myocardial infarction, and kidney damage. Classes include diuretics, beta-blockers, ACE inhibitors, ARBs, and calcium channel blockers.

209. Calcium Channel Blockers

Drugs such as amlodipine inhibit L-type calcium channels, reducing vascular smooth muscle contraction and causing vasodilation, useful in hypertension and angina.

210. Angiotensin Receptor Blockers (ARBs)

Medications like losartan block AT_1 receptors, preventing angiotensin II-mediated vasoconstriction and aldosterone release. Used in hypertension and heart failure as an ACE inhibitor alternative.

211. Anti-anginal Drugs

Medications used to relieve chest pain caused by myocardial ischemia. Include nitrates, beta-blockers, and calcium channel blockers, each working to improve oxygen supply-demand balance in the heart.

212. Nitrates

Drugs such as nitroglycerin cause venodilation, reducing preload, and coronary vasodilation, improving blood flow to ischemic myocardium. They provide rapid relief in angina pectoris.

213. Stable Angina

Chest discomfort triggered by exertion and relieved by rest or nitrates. Caused by fixed atherosclerotic narrowing of coronary arteries. Managed with anti-anginal drugs and lifestyle changes.

214. Unstable Angina

A form of acute coronary syndrome characterized by chest pain at rest or minimal exertion. Indicates high risk of myocardial infarction and requires urgent medical attention.

215. Anti-arrhythmic Drugs

Medications that restore or maintain normal heart rhythm by modifying impulse generation or conduction. Classified into Vaughan Williams classes I–IV based on their electrophysiological action.

216. Class I Anti-arrhythmics

Sodium channel blockers (e.g., lidocaine) that reduce depolarization rate in cardiac myocytes, slowing conduction and stabilizing the cardiac rhythm.

217. Class II Anti-arrhythmics

Beta-blockers (e.g., propranolol) that reduce sympathetic stimulation, slow heart rate, and prolong AV node conduction.

218. Class III Anti-arrhythmics

Potassium channel blockers (e.g., amiodarone) that prolong repolarization and refractory period, preventing reentry arrhythmias.

219. Class IV Anti-arrhythmics

Calcium channel blockers (e.g., verapamil) that slow AV nodal conduction and reduce ventricular rate in supraventricular tachycardia.

220. Hyperlipidemia

A condition characterized by elevated levels of lipids or lipoproteins in the blood, increasing the risk of atherosclerosis and cardiovascular diseases.

221. Statins

HMG-CoA reductase inhibitors (e.g., atorvastatin) that reduce cholesterol synthesis in the liver, lowering LDL cholesterol and cardiovascular risk.

222. Fibrates

Drugs like gemfibrozil that activate PPAR-α, increasing lipid metabolism and lowering triglycerides, beneficial in hypertriglyceridemia.

223. Niacin (Nicotinic Acid)

A vitamin B_3 derivative that reduces hepatic synthesis of VLDL, lowering LDL and triglycerides while raising HDL cholesterol.

224. Bile Acid Sequestrants

Drugs such as cholestyramine bind bile acids in the intestine, increasing their excretion and promoting hepatic cholesterol utilization.

225. LDL Cholesterol

Low-density lipoprotein cholesterol, often called “bad cholesterol,” carries cholesterol to tissues and contributes to plaque formation in arteries.

226. HDL Cholesterol

High-density lipoprotein cholesterol, known as "good cholesterol," transports cholesterol from tissues back to the liver for excretion, reducing cardiovascular risk.

227. Triglycerides

A form of fat stored in adipose tissue and used as an energy source. High blood triglycerides increase the risk of atherosclerosis and pancreatitis.

228. Atherosclerosis

A chronic disease involving plaque buildup in arterial walls, narrowing vessels and reducing blood flow, leading to angina, myocardial infarction, or stroke.

229. Myocardial Infarction

Commonly called a heart attack, caused by prolonged blockage of coronary arteries leading to irreversible myocardial cell death. Requires urgent reperfusion therapy.

230. Cardiac Output

The volume of blood pumped by the heart per minute, calculated as stroke volume × heart rate. It is a key parameter affected by cardiovascular drugs.

231. Shock

A life-threatening condition with inadequate tissue perfusion and oxygen delivery. Causes include hypovolemic, cardiogenic, distributive, and septic shock. Therapy aims to restore perfusion with fluids, vasopressors, and inotropes.

232. Dopamine

A catecholamine used in shock management. Low doses improve renal perfusion; moderate doses increase cardiac output via β_1 stimulation; high doses cause vasoconstriction via α_1 receptors.

233. Norepinephrine

First-line vasopressor in septic shock. Acts mainly on α_1 receptors causing vasoconstriction, increasing mean arterial pressure, with some β_1 cardiac stimulation.

234. Epinephrine

Adrenergic agonist stimulating α and β receptors, used in anaphylactic shock for bronchodilation, vasoconstriction, and increased cardiac output.

235. Hematinics

Agents like iron, folic acid, and vitamin B_{12} that help in hemoglobin synthesis and red blood cell production, used in anemia treatment.

236. Iron Preparations

Oral (ferrous sulfate) or parenteral (iron sucrose) forms supply iron for hemoglobin synthesis, treating iron-deficiency anemia.

237. Coagulants

Drugs like vitamin K (phytonadione) promote clotting by aiding synthesis of clotting factors II, VII, IX, and X.

238. Anticoagulants

Agents like heparin and warfarin prevent clot formation by inhibiting clotting factors. Used in DVT, pulmonary embolism, and atrial fibrillation.

239. Fibrinolytics

Drugs such as alteplase activate plasminogen to plasmin, dissolving fibrin clots in acute myocardial infarction or stroke.

240. Anti-platelet Drugs

Aspirin, clopidogrel inhibit platelet aggregation, reducing the risk of thrombosis in cardiovascular diseases.

241. Plasma Volume Expanders

Substances like dextran, albumin, hydroxyethyl starch restore blood volume in hypovolemia by increasing plasma oncotic pressure.

242. Diuretics

Drugs that increase urine output by inhibiting sodium reabsorption in nephrons, used in hypertension, edema, and heart failure.

243. Loop Diuretics

Furosemide inhibits Na^+-K^+-$2Cl^-$ transporter in the loop of Henle, producing potent diuresis and reducing pulmonary edema.

244. Thiazide Diuretics

Hydrochlorothiazide inhibits Na^+-Cl^- symporter in distal tubules, causing moderate diuresis, mainly for hypertension.

245. Potassium-Sparing Diuretics

Spironolactone antagonizes aldosterone in the collecting ducts, preventing potassium loss while promoting sodium excretion.

246. Osmotic Diuretics

Mannitol increases osmotic pressure in renal tubules, preventing water reabsorption; used to reduce intracranial and intraocular pressure.

247. Carbonic Anhydrase Inhibitors

Acetazolamide inhibits carbonic anhydrase, reducing bicarbonate reabsorption and producing mild diuresis; also used in glaucoma.

248. Anti-diuretic Hormone (ADH)

Vasopressin increases water reabsorption in the collecting ducts via V_2 receptor activation, reducing urine output.

249. Desmopressin

A synthetic ADH analog with strong antidiuretic but minimal vasoconstrictor action, used in diabetes insipidus and nocturnal enuresis.

250. ADH Antagonists

Tolvaptan blocks V_2 receptors, producing water diuresis without major electrolyte loss, useful in hyponatremia.

251. Diabetes Insipidus

A condition of excessive dilute urine production due to ADH deficiency or renal insensitivity; treated with desmopressin or thiazides.

252. Autacoids

Locally acting biological mediators, produced by tissues, with short duration of action. Examples include histamine, serotonin, prostaglandins, and bradykinin. They regulate inflammation, allergy, smooth muscle tone, and vascular permeability.

253. Classification of Autacoids

Includes amines (histamine, serotonin), polypeptides (bradykinin, substance P), lipid-derived (prostaglandins, thromboxanes, leukotrienes), and gaseous mediators (nitric oxide).

254. Histamine

A biogenic amine stored in mast cells, basophils, and enterochromaffin-like cells. Involved in allergy, gastric acid secretion, neurotransmission, and immune responses.

255. H1 Receptor Antagonists

Block histamine-induced smooth muscle contraction, vascular permeability, and itching. Examples: chlorpheniramine, loratadine. Used in allergic rhinitis, urticaria, and anaphylaxis adjunct.

256. H2 Receptor Antagonists

Reduce gastric acid secretion by blocking H2 receptors on parietal cells. Examples: ranitidine, famotidine. Used in peptic ulcer and GERD.

257. H3 Receptor Antagonists

Block presynaptic H3 receptors, enhancing histamine release in CNS. Used in narcolepsy (pitolisant).

258. H4 Receptor Antagonists

Investigational drugs blocking H4 receptors on immune cells, targeting chronic inflammation.

259. Serotonin (5-HT)

A monoamine neurotransmitter regulating mood, sleep, appetite, platelet aggregation, and GI motility. Synthesized from tryptophan.

260. 5-HT Agonists

Sumatriptan activates 5-$HT_1B/_1D$ receptors, causing cranial vasoconstriction in migraine.

261. 5-HT Antagonists

Ondansetron blocks 5-HT_3 receptors, preventing chemotherapy- and surgery-induced nausea/vomiting.

262. Prostaglandins (PGs)

Lipid mediators derived from arachidonic acid via cyclooxygenase. Regulate inflammation, uterine contraction, gastric protection, and renal function.

263. PG Analogs

Misoprostol (PGE_1 analog) prevents NSAID-induced ulcers; dinoprostone induces labor.

264. Thromboxanes (TXs)

Produced by platelets; promote vasoconstriction and platelet aggregation. Inhibited by aspirin via COX-1 blockade.

265. Leukotrienes (LTs)

Lipid mediators from lipoxygenase pathway; cause bronchoconstriction, increased mucus, and vascular permeability.

266. Leukotriene Receptor Antagonists

Montelukast blocks $CysLT_1$ receptors, preventing leukotriene-induced bronchoconstriction in asthma.

267. Angiotensin II

A potent vasoconstrictor peptide regulating blood pressure and fluid balance via AT_1 receptors; target for ACE inhibitors and ARBs.

268. Bradykinin

Peptide causing vasodilation, pain, and increased vascular permeability. Degraded by kininase II (ACE). ACE inhibitors increase bradykinin levels.

269. Substance P

Neuropeptide in pain transmission, inflammation, and smooth muscle contraction; acts on neurokinin-1 receptors.

270. NSAIDs

Non-steroidal anti-inflammatory drugs inhibit COX enzymes, reducing prostaglandin synthesis. Used for pain, fever, and inflammation.

271. Non-selective NSAIDs

Ibuprofen, diclofenac inhibit both COX-1 and COX-2, relieving inflammation but risking GI irritation.

272. COX-2 Selective Inhibitors

Celecoxib spares COX-1, reducing GI side effects but with possible cardiovascular risk.

273. Anti-gout Drugs

Agents reducing uric acid production (allopurinol) or enhancing excretion (probenecid), used in chronic gout.

274. Colchicine

An anti-inflammatory for acute gout; inhibits microtubule assembly, reducing neutrophil migration.

275. Allopurinol

Xanthine oxidase inhibitor reducing uric acid synthesis; prevents gout flares.

276. Febuxostat

Non-purine xanthine oxidase inhibitor; alternative to allopurinol in hyperuricemia.

277. Uricosuric Drugs

Probenecid increases renal uric acid excretion by blocking tubular reabsorption.

278. Disease-Modifying Antirheumatic Drugs (DMARDs)

Drugs that slow rheumatoid arthritis progression by modulating immune responses (methotrexate, sulfasalazine).

279. Methotrexate

First-line DMARD; inhibits dihydrofolate reductase, reducing immune cell proliferation.

280. Biological DMARDs

Target specific cytokines like TNF-α (etanercept, infliximab) to reduce joint inflammation.

281. Gold Salts

Auranofin suppresses immune activity in rheumatoid arthritis; less used due to toxicity.

282. Endocrine Pharmacology

Study of drugs that mimic, enhance, or inhibit the synthesis, release, or action of hormones. Involves hormone replacement, suppression therapy, and modulation of hormone receptors.

283. Hormone Analogues

Synthetic compounds structurally similar to natural hormones, designed to mimic or antagonize their effects. Example: Levothyroxine for hypothyroidism.

284. Pituitary Gland

Master endocrine gland secreting trophic hormones regulating thyroid, adrenal, gonadal, and growth functions.

285. Anterior Pituitary Hormones

Include GH, TSH, ACTH, FSH, LH, and prolactin; regulate target endocrine organs.

286. Growth Hormone (GH)

Stimulates growth and metabolism via IGF-1; excess causes acromegaly, deficiency causes dwarfism.

287. GH Analogues

Somatropin used in GH deficiency; Mecasermin (IGF-1 analogue) for severe deficiency.

288. GH Inhibitors

Octreotide and lanreotide (somatostatin analogues) suppress GH in acromegaly.

289. Thyroid Hormones (T3, T4)

Regulate metabolism, growth, and CNS development; deficiency causes hypothyroidism, excess causes thyrotoxicosis.

290. Thyroid Hormone Analogues

Levothyroxine (synthetic T4) and liothyronine (synthetic T3) for hypothyroidism.

291. Antithyroid Drugs

Methimazole, propylthiouracil inhibit thyroid peroxidase; reduce T3/T4 synthesis.

292. Radioactive Iodine (I-131)

Destroys overactive thyroid tissue in hyperthyroidism.

293. Parathyroid Hormone (PTH)

Increases plasma calcium by stimulating bone resorption, renal reabsorption, and activating vitamin D.

294. PTH Analogues

Teriparatide used in osteoporosis to stimulate bone formation.

295. Calcitonin

Hormone from thyroid C-cells; lowers plasma calcium by inhibiting osteoclast activity.

296. Calcitonin Drugs

Salmon calcitonin used in hypercalcemia and osteoporosis.

297. Vitamin D

Enhances calcium and phosphate absorption; deficiency causes rickets/osteomalacia.

298. Vitamin D Analogues

Calcitriol, alfacalcidol used in chronic kidney disease and hypocalcemia.

299. Insulin

Peptide hormone from pancreatic β-cells; lowers blood glucose by promoting cellular uptake.

300. Types of Insulin

Rapid-acting (lispro), short-acting (regular), intermediate (NPH), long-acting (glargine).

301. Oral Hypoglycemic Agents

Drugs lowering blood glucose in type 2 diabetes without insulin injection.

302. Sulfonylureas

Glipizide, glimepiride stimulate β-cells to release insulin.

303. Biguanides

Metformin reduces hepatic glucose production, increases insulin sensitivity.

304. Thiazolidinediones (TZDs)

Pioglitazone activates PPAR-γ, improving insulin sensitivity.

305. DPP-4 Inhibitors

Sitagliptin prolongs incretin action, enhancing insulin release.

306. SGLT-2 Inhibitors

Empagliflozin increases urinary glucose excretion.

307. Glucagon

Pancreatic α-cell hormone raising blood glucose by stimulating glycogenolysis.

308. ACTH

Stimulates adrenal cortex to secrete corticosteroids; synthetic cosyntropin used in diagnostic testing.

309. Corticosteroids

Adrenal cortex hormones with glucocorticoid (metabolic, anti-inflammatory) and mineralocorticoid (salt-retaining) activity.

310. Glucocorticoids

Prednisone, dexamethasone reduce inflammation, suppress immunity.

311. Mineralocorticoids

Fludrocortisone promotes sodium retention in Addison's disease.

312. Androgens

Male sex hormones, mainly testosterone, secreted by testes and adrenal cortex. Regulate

male sexual characteristics, spermatogenesis, muscle mass, and libido. Used in hypogonadism, delayed puberty, and certain anemias. Adverse effects include acne, baldness, and hepatotoxicity.

313. Testosterone

Primary androgen produced in Leydig cells. Administered as esters (enanthate, cypionate) to treat androgen deficiency. Exhibits anabolic and androgenic effects.

314. Anabolic Steroids

Synthetic derivatives of testosterone with enhanced anabolic and reduced androgenic activity. Promote muscle growth and nitrogen retention. Used clinically in wasting disorders but abused in sports.

315. Adverse Effects of Anabolic Steroids

Include liver damage, cardiovascular risk, endocrine suppression, and behavioral changes. Chronic abuse can cause infertility.

316. Anti-Androgens

Drugs like flutamide and bicalutamide block androgen receptors. Used in prostate cancer and hyperandrogenism.

317. Estrogens

Female sex hormones (estradiol, estrone, estriol) from ovaries. Regulate menstrual cycle, secondary sex traits, and bone health. Used in menopause, contraception, and estrogen deficiency.

318. Synthetic Estrogens

Ethinyl estradiol, mestranol used in oral contraceptives. High potency and longer duration than natural forms.

319. Anti-Estrogens

Tamoxifen blocks estrogen receptors in breast tissue (used in breast cancer) but acts as partial agonist in bone and endometrium.

320. Progesterone

Hormone from corpus luteum and placenta. Prepares endometrium for implantation, maintains pregnancy, and suppresses ovulation.

321. Synthetic Progestins

Medroxyprogesterone, norethisterone used in contraception, menstrual disorders, and endometrial carcinoma.

322. Oral Contraceptives (Combined)

Contain estrogen and progestin. Prevent ovulation via hypothalamic-pituitary suppression, thicken cervical mucus, and alter endometrium.

323. Progestin-Only Pills

Mini-pills preventing pregnancy by cervical mucus thickening and endometrial changes; suitable for lactating women.

324. Emergency Contraceptives

High-dose levonorgestrel or ulipristal acetate taken within 72 hours of unprotected sex to prevent ovulation or implantation.

325. Drugs Acting on Uterus

Include oxytocics (stimulate uterine contraction) and tocolytics (inhibit uterine contraction) used in obstetric management.

326. Oxytocics

Oxytocin, ergometrine, prostaglandins used to induce labor, control postpartum hemorrhage.

327. Tocolytics

Beta-2 agonists (ritodrine), calcium channel blockers (nifedipine), and magnesium sulfate delay preterm labor.

328. Bioassay

Quantitative estimation of potency of a drug using living cells, tissues, or animals, comparing with a standard preparation under identical conditions.

329. Principles of Bioassay

Based on producing a measurable biological response proportional to drug concentration; includes comparison with standard drug response.

330. Applications of Bioassay

Used for standardization of biological products, quality control, potency testing, and pharmacological research.

331. Types of Bioassay

Direct, indirect, quantal, graded response, and three-point or four-point assays, depending on endpoint and method.

332. Graded Response Bioassay

Measures intensity of response proportional to drug concentration, e.g., contraction of isolated tissue.

333. Quantal Response Bioassay

Measures all-or-none responses in test organisms, e.g., percentage mortality.

334. Three-Point Bioassay

Compares two doses of standard and one test dose; used when intermediate precision is required.

335. Four-Point Bioassay

Compares two doses each of standard and test drug, improving accuracy and reducing variability.

336. Bioassay of Insulin

Measured by its hypoglycemic effect in fasting rabbits or mice, compared to standard insulin preparation.

337. Bioassay of Oxytocin

Determined by uterine contraction in estrogen-primed rats or isolated uterine tissue from animals.

338. Bioassay of Vasopressin

Based on antidiuretic action in hydrated rats or pressor effect on anesthetized dogs.

339. Bioassay of ACTH

Measured by increase in adrenal ascorbic acid depletion in rats or corticosteroid production.

340. Bioassay of d-Tubocurarine

Assessed by skeletal muscle relaxation and inhibition of contraction in frog rectus abdominis or other muscle preparations.

341. Bioassay of Digitalis, Histamine & 5-HT

Digitalis – cardiac contractility in cat heart; Histamine – contraction of guinea pig ileum; 5-HT – rabbit aortic strip contraction.

BP504 T. PHARMACOGNOSY AND PHYTOCHEMISTRY II(Theory)

342. Primary Metabolites

Compounds essential for plant growth and development, including carbohydrates, amino acids, nucleotides, and lipids. They are formed during primary metabolism and serve as precursors for secondary metabolites. Examples: glucose, pyruvate, fatty acids.

343. Secondary Metabolites

Organic compounds not directly involved in growth but important for plant defense, signaling, and interaction. Produced via specialized pathways like shikimic acid, acetate, and amino acid pathways. Examples: alkaloids, flavonoids, terpenes.

344. Shikimic Acid Pathway

A biosynthetic route in plants and microorganisms leading to the formation of aromatic amino acids (phenylalanine, tyrosine, tryptophan). It also gives rise to phenolic compounds, flavonoids, and lignin.

345. Acetate Pathway

Also called the polyketide pathway, it produces fatty acids, polyketides, and certain terpenoids from acetyl-CoA units. Important in biosynthesis of waxes, oils, and medicinal compounds.

346. Amino Acid Pathway

Utilizes amino acids as precursors for secondary metabolites like alkaloids, cyanogenic glycosides, and glucosinolates. Involves transamination, decarboxylation, and condensation reactions.

347. Phenylpropanoid Pathway

Branch from shikimic acid pathway leading to phenolic compounds such as lignin, flavonoids, tannins, and coumarins, important for structural and defense roles.

348. Terpenoid Biosynthesis

Formation of terpenes from isoprene units via mevalonate or non-mevalonate pathways. Produces monoterpenes, diterpenes, triterpenes, and carotenoids.

349. Alkaloid Biosynthesis

Production of nitrogen-containing secondary metabolites from amino acids like tryptophan, tyrosine, and ornithine. Includes morphine, quinine, and nicotine.

350. Polyketide Biosynthesis

Formation of complex compounds via condensation of acetyl-CoA or malonyl-CoA units. Includes anthraquinones, flavonoids, and antibiotics.

351. Radioactive Isotopes in Plant Studies

Unstable isotopes like C-14, H-3, and P-32 are used to trace metabolic pathways by detecting their incorporation into metabolites.

352. Carbon-14 Tracer Technique

Used to study carbon flow in metabolic processes. Plants are exposed to CO_2 containing C-14, and radioactivity in products is measured.

353. Autoradiography

Technique where radioactive samples are placed against photographic film to visualize metabolite location in plant tissues.

354. Liquid Scintillation Counting

Sensitive method to detect low-energy beta emissions from isotopes like tritium in biochemical assays.

355. Shikimate-Derived Compounds

Includes aromatic amino acids, chlorogenic acid, coumarins, and stilbenes, all important in plant defense and pigmentation.

356. Mevalonate Pathway

Acetate-derived route producing isopentenyl pyrophosphate (IPP), the building block for terpenoids.

357. Non-Mevalonate Pathway (MEP Pathway)

Alternate isoprenoid biosynthesis route in plastids starting from pyruvate and glyceraldehyde-3-phosphate.

358. Lignin Biosynthesis

Phenylpropanoid derivatives polymerized to form lignin, strengthening plant cell walls and providing water transport efficiency.

359. Flavonoid Biosynthesis

Formation of pigments influencing flower color, UV protection, and plant-microbe interactions, mainly from phenylalanine.

360. Coumarin Formation

Phenolic compounds with fragrant properties, derived from cinnamic acid. Functions in plant defense.

361. Stilbene Pathway

Produces stilbenes like resveratrol with antioxidant and antifungal properties, important for plant defense.

362. Quinones in Plants

Pigments and electron carriers derived from shikimic or acetate pathways. Includes anthraquinones in medicinal plants.

363. Cyanogenic Glycoside Biosynthesis

From amino acids, producing compounds that release toxic hydrogen cyanide upon tissue damage.

364. Glucosinolate Formation

Sulfur-containing compounds from amino acids like methionine, involved in pest defense and flavor.

365. Plant Radiorespirometry

Measures CO_2 evolution from radioactive substrates to study respiratory metabolism.

366. Precursor Feeding Experiments

Supplying labeled precursors to plants to trace metabolic conversion into target compounds.

367. Biosynthetic Block Studies

Using enzyme inhibitors to identify steps in a metabolic pathway by observing intermediate accumulation.

368. Isotopic Dilution Method

Determines turnover rates of metabolites by mixing labeled and unlabeled compounds.

369. Metabolic Flux Analysis

Quantitative study of metabolite flow through pathways using isotope labeling and computational modeling.

370. Plant Secondary Metabolite Function

Includes defense against herbivores, UV protection, pollinator attraction, and antimicrobial activity.

371. Integration of Pathways

Secondary metabolite pathways are interconnected; shikimate-derived phenolics may conjugate with acetate-derived moieties to form complex molecules.

372. Alkaloids

Nitrogen-containing secondary metabolites, usually derived from amino acids, with significant pharmacological activities. They often have bitter taste and complex ring structures. Examples include morphine, quinine, and vincristine. Biosynthesized mainly via shikimate and amino acid pathways, alkaloids act as plant defense chemicals. They are used therapeutically as analgesics, anticancer agents, antihypertensives, and antimalarials.

373. Vinca Alkaloids

Isolated from *Catharanthus roseus*, these indole alkaloids (vincristine, vinblastine) inhibit microtubule formation, arresting cell division in metaphase. Used in chemotherapy for cancers like Hodgkin's lymphoma, leukemia, and breast cancer. Extracted from leaves, they represent a classic example of plant-derived anticancer agents.

374. Rauwolfia Alkaloids

Obtained from *Rauwolfia serpentina* roots, these indole alkaloids include reserpine and ajmaline. They act on adrenergic nerve endings, depleting catecholamines. Traditionally used as antihypertensive and antipsychotic agents.

375. Belladonna Alkaloids

Derived from *Atropa belladonna*, these tropane alkaloids (atropine, scopolamine) block muscarinic acetylcholine receptors. Used to treat bradycardia, motion sickness, and as pre-anesthetic agents.

376. Opium Alkaloids

From *Papaver somniferum* latex, containing morphine, codeine, and papaverine. Morphine is a potent analgesic; codeine is an antitussive; papaverine is a vasodilator.

377. Phenylpropanoids

Aromatic compounds derived from phenylalanine via phenylpropanoid pathway. Includes lignans, coumarins, flavonoids, important for structural integrity, pigmentation, and defense.

378. Lignans

Phenolic dimers derived from phenylpropanoids with antioxidant, anticancer, and estrogenic activities. Found in flaxseed, sesame, and medicinal plants.

379. Tea Polyphenols

From *Camellia sinensis*, containing catechins, theaflavins, and tannins. They have antioxidant, anti-inflammatory, and cardioprotective effects.

380. Ruta Alkaloids

From *Ruta graveolens*, containing furanocoumarins and quinoline alkaloids with antispasmodic and antimicrobial properties.

381. Steroids

Lipophilic compounds derived from cyclopentanoperhydrophenanthrene skeleton. Include hormones, saponins, and medicinal steroids.

382. Liquorice Saponins

From *Glycyrrhiza glabra*, containing glycyrrhizin with anti-inflammatory, expectorant, and hepatoprotective properties.

383. Dioscorea Steroidal Saponins

From *Dioscorea* tubers, containing diosgenin, a precursor for semi-synthetic steroid hormones.

384. Cardiac Glycosides

Steroid glycosides affecting heart muscle contractility. Found in *Digitalis* species; used in heart failure.

385. Digitalis Glycosides

From *Digitalis purpurea* leaves, containing digoxin and digitoxin. Inhibit Na^+/K^+-ATPase to increase cardiac contractility.

386. Triterpenoids

Thirty-carbon compounds formed from six isoprene units. Exhibit anti-inflammatory, hepatoprotective, and antimicrobial effects.

387. Volatile Oils

Aromatic plant oils containing terpenes, alcohols, esters. Used in flavoring, perfumery, and medicine.

388. Mentha Oil

From *Mentha piperita*, rich in menthol, used as carminative, flavoring agent, and in topical analgesics.

389. Clove Oil

From *Syzygium aromaticum*, containing eugenol with antiseptic, analgesic, and flavoring properties.

390. Cinnamon Oil

From *Cinnamomum verum*, containing cinnamaldehyde with antimicrobial and antioxidant activity.

391. Fennel Oil

From *Foeniculum vulgare*, rich in anethole, used as carminative and digestive aid.

392. Coriander Oil

From *Coriandrum sativum* seeds, containing linalool with antimicrobial and flavoring uses.

393. Tannins

Polyphenolic compounds binding proteins; have astringent, antimicrobial, and antioxidant properties.

394. Catechu

From *Acacia catechu*, rich in catechin tannins, used as astringent and in tanning leather.

395. Pterocarpus Tannins

From *Pterocarpus marsupium*, with antidiabetic and astringent properties.

396. Resins

Non-volatile plant exudates containing terpenoids. Used in varnishes, incense, and medicine.

397. Benzoin Resin

From *Styrax benzoin*, used in perfumes, incense, and as antiseptic.

398. Guggul Resin

From *Commiphora mukul*, containing guggulsterones with hypolipidemic properties.

399. Asafoetida

From *Ferula asafoetida*, oleo-gum-resin with carminative and antimicrobial effects.

400. Myrrh Resin

From *Commiphora myrrha*, with antiseptic and anti-inflammatory uses.

401. Colophony

From *Pinus* species, used in adhesives, varnishes, and ointments.

402. Terpenoids

A large class of plant secondary metabolites built from isoprene units, classified into monoterpenes, sesquiterpenes, diterpenes, etc. They contribute to aroma, flavor, and medicinal properties. Terpenoids are isolated via steam distillation, solvent extraction, or chromatography, and identified using GC-MS, IR, and NMR.

403. Menthol

A monoterpene alcohol from *Mentha piperita* oil, possessing cooling, analgesic, and antipruritic effects. Isolated by fractional crystallization of peppermint oil, identified by melting point, optical rotation, and IR spectroscopy.

404. Citral

A lemon-scented aldehyde mixture (geranial + neral) found in lemongrass oil. Used in flavoring, perfumery, and vitamin A synthesis. Isolated via steam distillation, characterized by boiling point and GC analysis.

405. Artemisinin

A sesquiterpene lactone from *Artemisia annua* with potent antimalarial activity. Isolated using solvent extraction (n-hexane, petroleum ether), purified by column chromatography, and confirmed by HPLC and MS.

406. Glycosides

Compounds consisting of a sugar moiety linked to a non-sugar aglycone, showing diverse bioactivities. Extracted using hydroalcoholic solvents, analyzed by TLC, UV-Vis, and enzymatic hydrolysis.

407. Glycyrrhetinic Acid

A triterpenoid aglycone from *Glycyrrhiza glabra*, obtained by hydrolysis of glycyrrhizin. Shows anti-inflammatory and hepatoprotective effects. Identified by IR and NMR spectra.

408. Rutin

A flavonoid glycoside from *Fagopyrum esculentum* and *Citrus* species, possessing antioxidant and capillary-strengthening effects. Isolated via ethanol extraction, purified by recrystallization, and analyzed by UV spectroscopy.

409. Alkaloids

Nitrogenous secondary metabolites derived mainly from amino acids, with significant therapeutic applications. Extraction typically involves acid-base procedures, followed by TLC, HPLC, and spectroscopic identification.

410. Atropine

A tropane alkaloid from *Atropa belladonna*, acting as a muscarinic antagonist. Isolated using acidified aqueous extraction, purified by solvent partitioning, and analyzed by UV and IR.

411. Quinine

A quinoline alkaloid from *Cinchona* bark, with antimalarial and antipyretic effects. Extracted by acid-base treatment, purified by crystallization, and confirmed by polarimetry and TLC.

412. Reserpine

An indole alkaloid from *Rauwolfia serpentina*, acting as an antihypertensive by depleting catecholamines. Isolated via solvent extraction, purified by column chromatography, and analyzed by HPLC.

413. Caffeine

A purine alkaloid from coffee, tea, and cocoa, functioning as a CNS stimulant. Isolated via hot water extraction and chloroform partitioning, confirmed by melting point and TLC.

414. Resins

Non-volatile plant exudates containing terpenoids and phenolics. Extracted by organic solvents, analyzed using FTIR, GC-MS, and TLC.

415. Podophyllotoxin

A lignan resin from *Podophyllum* species, showing antimitotic and antiviral activity. Isolated via methanol extraction, purified by chromatography, and analyzed by HPLC.

416. Curcumin

A diarylheptanoid pigment from *Curcuma longa*, with anti-inflammatory and antioxidant effects. Extracted using ethanol, purified by recrystallization, and quantified by UV-Vis and HPLC.

417. Steam Distillation

A separation technique for volatile compounds like terpenoids, using steam to lower boiling points and prevent decomposition.

418. Solvent Extraction

Uses organic solvents (ethanol, hexane, chloroform) to dissolve phytoconstituents selectively, followed by concentration and purification.

419. Soxhlet Extraction

Continuous extraction method using a refluxing solvent, ideal for solid samples containing non-volatile compounds.

420. Column Chromatography

A separation technique using a stationary phase (silica, alumina) and mobile phase to fractionate phytoconstituents based on polarity.

421. Thin Layer Chromatography (TLC)

A quick method to identify compounds by comparing Rf values with standards.

422. High Performance Liquid Chromatography (HPLC)

An advanced separation method providing quantitative and qualitative analysis of phytoconstituents with high resolution.

423. Gas Chromatography (GC)

Separates volatile compounds like menthol and citral, often coupled with MS for identification.

424. UV-Visible Spectroscopy

Used to identify chromophoric compounds like curcumin and rutin by measuring absorbance at specific wavelengths.

425. Infrared Spectroscopy (IR)

Analyzes functional groups in compounds by detecting molecular vibrations.

426. Nuclear Magnetic Resonance (NMR)

Provides structural information about phytoconstituents using proton or carbon environments.

427. Mass Spectrometry (MS)

Determines molecular weight and fragmentation pattern for compound identification.

428. Bioassay-Guided Fractionation

An approach where extracts are fractionated, and biological activity guides compound isolation.

429. Crystallization

Purification technique exploiting differences in solubility to obtain pure compounds.

430. Melting Point Determination

Used for compound purity assessment; pure substances have sharp melting points.

431. Optical Rotation

Measurement of compound's ability to rotate plane-polarized light, used for chiral phytoconstituents like menthol and quinine.

432. Industrial Production

The large-scale manufacturing of phytoconstituents involves cultivation of source plants, optimized harvesting, extraction using solvents or supercritical CO_2, purification via chromatography, and formulation into dosage forms. Key steps include standardization to ensure batch-to-batch consistency and compliance with pharmacopeial standards.

433. Forskolin

A labdane diterpenoid from *Coleus forskohlii*, produced industrially by root harvesting, ethanol extraction, and column chromatography. It activates adenylate cyclase, increasing cAMP, used in glaucoma, asthma, and weight management. Estimated via HPLC at 210–220 nm.

434. Sennoside

Anthraquinone glycosides from *Cassia angustifolia* leaves and pods, extracted by hydroalcoholic methods. Industrially used as stimulant laxatives. Quantified by spectrophotometry after acid hydrolysis or HPLC. Standardized preparations are essential for dose accuracy.

435. Artemisinin

A sesquiterpene lactone from *Artemisia annua*, obtained via solvent extraction or semi-synthetic biosynthesis using engineered yeast. Primary use is in ACT (artemisinin-based combination therapy) for malaria. Quantified by HPLC or LC-MS.

436. Diosgenin

A steroidal sapogenin from *Dioscorea* species, extracted with ethanol or methanol. Industrially converted into steroidal drugs like corticosteroids and contraceptives. Estimated by spectrophotometric methods after hydrolysis.

437. Digoxin

A cardiac glycoside from *Digitalis lanata*, produced by leaf extraction with aqueous alcohol, followed by purification using lead acetate precipitation and chromatography. Used in heart failure and arrhythmias. Quantified by HPLC or immunoassay.

438. Atropine

A tropane alkaloid from *Atropa belladonna*, manufactured via acid-base extraction from dried leaves/roots. Employed in ophthalmology, anesthesia premedication, and antidote for organophosphate poisoning. Estimated by HPLC or titrimetric methods.

439. Podophyllotoxin

A lignan from *Podophyllum* rhizomes, extracted by alcohol, purified with column chromatography. Precursor for anticancer drugs like etoposide and teniposide. Estimated via HPLC at ~290 nm.

440. Caffeine

A purine alkaloid from *Coffea*, *Camellia*, and *Theobroma*, produced by water or supercritical CO_2 extraction. Used as CNS stimulant and diuretic. Quantified by UV spectrophotometry or HPLC.

441. Taxol (Paclitaxel)

A diterpenoid from *Taxus brevifolia* bark or via semi-synthesis from 10-DAB (from *Taxus baccata* leaves). Used in cancer chemotherapy. Estimated by HPLC with UV detection at 227 nm.

442. Vincristine

An indole alkaloid from *Catharanthus roseus*, isolated by acidified ethanol extraction and

chromatography. Used as an antineoplastic in leukemia and lymphoma. Estimated via HPLC with fluorescence detection.

443. Vinblastine

Similar to vincristine but with different side chain; obtained from the same plant source. Used in Hodgkin's lymphoma and testicular cancer treatment. Quantified by HPLC.

444. Plant Cell Culture Production

Biotechnological method using in vitro plant cells/tissues to produce phytoconstituents, reducing dependence on wild harvesting. Used for compounds like taxol and vincristine.

445. Supercritical CO_2 Extraction

Industrial green extraction method using CO_2 under high pressure and temperature, ideal for caffeine, essential oils, and lipophilic compounds.

446. Solvent Recovery Systems

Closed-loop systems in industrial extraction plants for reclaiming and reusing solvents, ensuring cost efficiency and environmental safety.

447. Standardization

Process of ensuring phytoconstituent content meets pharmacopeial specifications, involving analytical methods, calibration curves, and quality control.

448. HPLC in Estimation

High-performance liquid chromatography is widely used in quantitative estimation of phytoconstituents due to high resolution and reproducibility.

449. LC-MS

Liquid chromatography coupled with mass spectrometry allows precise quantification and structural elucidation, particularly for low-level constituents like vincristine.

450. Spectrophotometry

A simple, cost-effective method for estimation of compounds with strong UV-visible absorption, e.g., diosgenin, sennoside.

451. Bioassays in Estimation

Biological testing to estimate activity-related potency, e.g., digoxin using guinea pig heart assay.

452. Purification by Column Chromatography

Industrial purification method separating phytoconstituents based on polarity, using silica, alumina, or polymer resins.

453. Crystallization in Industrial Purification

Used for pure form isolation of heat-stable compounds like caffeine and diosgenin.

454. Co-solvent Extraction

Technique using mixed solvents to improve yield and selectivity in phytochemical production.

455. Downstream Processing

Steps following extraction to yield final product: purification, concentration, drying, formulation.

456. Spray Drying

Industrial drying method producing fine powders from liquid extracts, improving stability and handling.

457. Freeze Drying

Lyophilization technique preserving heat-sensitive phytoconstituents like digoxin and vinblastine.

458. Semi-Synthetic Modification

Chemical modification of natural products to improve activity, stability, or bioavailability, e.g., paclitaxel derivatives.

459. Scale-Up Challenges

Difficulties in transferring lab-scale extraction to industrial level while maintaining quality and yield.

460. Good Manufacturing Practices (GMP)

Regulatory framework ensuring pharmaceutical-grade production of phytoconstituents with quality and safety.

461. Commercial Applications

Use of phytoconstituents across pharmaceuticals, nutraceuticals, cosmetics, and food industries, driven by demand for natural bioactives.

462. Phytochemistry

The branch of chemistry dealing with chemical constituents of plants, focusing on their

extraction, isolation, purification, structural elucidation, and bioactivity evaluation. It links plant metabolism with pharmacological potential.

463. Modern Extraction Methods

Advanced techniques such as supercritical CO_2 extraction, microwave-assisted extraction, and ultrasound-assisted extraction, designed to improve yield, selectivity, and stability while reducing solvent usage.

464. Supercritical Fluid Extraction (SFE)

Uses CO_2 above its critical temperature and pressure to selectively dissolve target compounds. Ideal for thermolabile substances like essential oils and caffeine.

465. Microwave-Assisted Extraction (MAE)

Employs microwave energy to rapidly heat plant matrices and solvents, enhancing mass transfer and reducing extraction time.

466. Ultrasound-Assisted Extraction (UAE)

Utilizes ultrasonic waves to disrupt plant cell walls, increasing solvent penetration and extraction efficiency for both polar and non-polar compounds.

467. Soxhlet Extraction

A continuous hot percolation method for exhaustive extraction of non-volatile compounds using organic solvents.

468. Pressurized Liquid Extraction (PLE)

Also called accelerated solvent extraction; applies high temperature and pressure to enhance solubility and reduce extraction time.

469. Solid Phase Extraction (SPE)

Sample preparation method using solid adsorbents to isolate target analytes from complex mixtures before analysis.

470. Spectroscopy

Analytical technique measuring interaction between matter and electromagnetic radiation to identify and quantify compounds.

471. UV-Visible Spectroscopy

Measures absorbance in ultraviolet and visible ranges; useful for quantifying chromophore-containing phytoconstituents.

472. Infrared (IR) Spectroscopy

Determines functional groups based on molecular vibrations; important in identifying phytochemical classes.

473. Fourier Transform Infrared (FTIR) Spectroscopy

Advanced IR method with high resolution and speed; provides detailed molecular fingerprinting of plant extracts.

474. Nuclear Magnetic Resonance (NMR) Spectroscopy

Elucidates molecular structure using magnetic properties of nuclei; both ^{1}H and ^{13}C NMR are widely used in phytochemistry.

475. Mass Spectrometry (MS)

Identifies compounds by mass-to-charge ratio; coupled with chromatography for sensitive, specific detection.

476. Gas Chromatography (GC)

Separates volatile constituents; often paired with MS for essential oil analysis.

477. High-Performance Liquid Chromatography (HPLC)

Separates and quantifies non-volatile compounds with high resolution; a gold standard in plant constituent analysis.

478. Thin Layer Chromatography (TLC)

Quick, inexpensive method for phytochemical profiling; spots visualized by UV light or chemical reagents.

479. High-Performance Thin Layer Chromatography (HPTLC)

Automated, high-resolution version of TLC with densitometric scanning for quantitative analysis.

480. Column Chromatography

Uses stationary phase columns for preparative isolation of phytochemicals, exploiting polarity differences.

481. Ion-Exchange Chromatography

Separates compounds based on charge interactions; effective for alkaloids and glycosides.

482. Size-Exclusion Chromatography (SEC)

Separates molecules by size; used for polysaccharides and proteins in plant extracts.

483. Affinity Chromatography

Relies on specific ligand-analyte binding; applied in purifying enzymes or lectins from plants.

484. Electrophoresis

Separates charged biomolecules under an electric field; important for plant proteins and nucleic acids.

485. Paper Electrophoresis

Early technique using paper strips for separation of charged phytoconstituents in buffer systems.

486. Capillary Electrophoresis (CE)

Modern, high-resolution method for small molecule separation in narrow capillaries under high voltage.

487. Two-Dimensional Electrophoresis (2-DE)

Combines isoelectric focusing and SDS-PAGE to separate plant proteins by charge and size.

488. Bioautography

Combines TLC separation with biological assays on the same plate to locate active phytochemicals.

489. Phytochemical Fingerprinting

Comprehensive chemical profile generation using combined chromatographic and spectroscopic techniques.

490. Chemometric Analysis

Application of multivariate statistical tools to interpret complex phytochemical data for quality control.

491. Quality Control of Herbal Drugs

Ensures identity, purity, potency, and safety of crude drugs using advanced extraction and analytical technologies.

BP505 T. PHARMACEUTICAL JURISPRUDENCE(Theory)

492. Drugs and Cosmetics Act, 1940

An Indian legislation enacted to regulate the import, manufacture, distribution, and sale of drugs and cosmetics. Its objective is to ensure that drugs and cosmetics sold are safe, effective, and meet quality standards. The Act is supplemented by the Drugs and Cosmetics Rules, 1945, which detail procedures, licensing, and classifications.

493. Drugs and Cosmetics Rules, 1945

Framed under the Drugs and Cosmetics Act to provide detailed guidelines for enforcement. They define procedures for licensing, quality control, testing, labelling, packing, and specify conditions for import, manufacture, and sale of drugs and cosmetics.

494. Objectives of the Act

To ensure the availability of quality drugs and cosmetics, prevent adulteration or spurious products, regulate licensing, and protect public health by laying down legal standards for safety and efficacy.

495. Legal Definition of 'Drug'

Covers all medicines for internal or external use, substances intended for diagnosis, treatment, or prevention of diseases in humans or animals, and includes medical devices and disinfectants.

496. Legal Definition of 'Cosmetic'

Any article intended to be applied to the human body for cleansing, beautifying, promoting attractiveness, or altering appearance, excluding soaps, unless specifically declared as a cosmetic.

497. Schedule to the Act

Schedules are appended lists under the Rules providing specific details such as classification, forms, tests, standards, and exemptions. Each schedule serves a distinct regulatory purpose.

498. Schedule M

Specifies good manufacturing practices (GMP) for pharmaceutical products, covering requirements for premises, plant, equipment, documentation, and hygiene.

499. Schedule Y

Lays down requirements and guidelines for clinical trials for new drugs, ensuring ethical conduct, informed consent, and safety monitoring.

500. Schedule H

Lists prescription drugs that can only be sold on a registered medical practitioner's prescription, to prevent misuse and self-medication risks.

501. Import of Drugs

Refers to bringing drugs or cosmetics into India from other countries, regulated to ensure only safe and approved products enter the market.

502. Prohibited Imports

Includes adulterated, spurious, misbranded drugs or cosmetics, drugs not of standard quality, and those banned by law for safety reasons.

503. Import License

A permit issued by the licensing authority allowing import of specified drugs or cosmetics. Different forms exist depending on product type and intended use.

504. Offences under the Act

Acts that violate provisions, such as manufacturing spurious drugs, misbranding, or selling without a license. These are punishable under specific sections.

505. Penalties under the Act

Legal punishments, which may include imprisonment, fines, or both, depending on the severity of the offence and whether it is a repeat offence.

506. Manufacture of Drugs

Refers to all processes of producing drugs, including processing, packaging, labelling, and quality testing, under controlled conditions.

507. Prohibition of Manufacture

The Act bans the manufacture of spurious, adulterated, misbranded drugs, or those not conforming to prescribed standards.

508. Conditions for Grant of License

Criteria an applicant must meet to receive manufacturing approval, such as qualified technical staff, GMP compliance, and adequate facilities.

509. Conditions of License

Obligations for license holders, including maintenance of records, regular testing, adherence to quality standards, and inspections.

510. Loan License

A license issued to an applicant who does not have manufacturing facilities but intends to use another licensee's facilities to manufacture drugs.

511. Repacking License

Issued to those involved in repacking bulk drugs into smaller packages, provided quality and labeling requirements are met.

512. Manufacture for Test and Analysis

Special provision allowing production of drugs for the purpose of research, examination, and laboratory analysis, without commercial distribution.

513. Manufacture of New Drug

Production of a drug not previously used in India, requiring approval from the licensing authority after evaluation of safety and efficacy data.

514. Misbranded Drug

A drug with false, misleading, or incomplete labeling, or one presented in a deceptive manner.

515. Adulterated Drug

A drug contaminated with foreign substances, harmful additives, or prepared in insanitary conditions, making it unsafe.

516. Spurious Drug

A counterfeit or fake drug that is intentionally mislabeled to resemble another brand or product.

517. Licensing Authority

The government-appointed body or officer responsible for issuing, renewing, and monitoring licenses under the Act.

518. Standard Quality

The defined criteria for purity, potency, and safety of drugs as prescribed in the official pharmacopoeia or rules.

519. Central Drugs Laboratory (CDL)

A government laboratory responsible for analysis and testing of drugs and cosmetics to ensure compliance with standards.

520. Drug Inspector

An appointed official with powers to inspect premises, take samples, and enforce provisions of the Act.

521. Consumer Protection under the Act

Safeguards built into the Act to protect end-users from harmful, fake, or substandard drugs and cosmetics through strict enforcement and penalties.

522. Schedule G

Lists drugs that must be taken only under medical supervision, often requiring caution labels stating they are dangerous if taken without a doctor's advice. Includes hormonal preparations, potent medicines, and certain anti-cancer agents.

523. Schedule H

Specifies prescription-only medicines that cannot be sold without a valid prescription from a registered medical practitioner. Labels must carry the "Rx" symbol and warning statements.

524. Schedule M

Outlines Good Manufacturing Practices (GMP) for pharmaceuticals, detailing requirements for premises, equipment, hygiene, and documentation to ensure consistent quality.

525. Schedule N

Prescribes the minimum equipment, furniture, and facility standards required for a retail or wholesale pharmacy.

526. Schedule P

Specifies the shelf life (expiry periods) for different drugs and the conditions under which they must be stored.

527. Schedule T

Covers Good Manufacturing Practices for Ayurvedic, Siddha, and Unani medicines, ensuring quality and safety of traditional systems of medicine.

528. Schedule U

Mandates detailed record-keeping of raw materials, batch manufacturing records, and test reports to maintain traceability and quality control.

529. Schedule V

Provides standards for patent and proprietary medicines, including permissible therapeutic claims, labelling rules, and formula disclosure.

530. Schedule X

Lists narcotic and psychotropic substances requiring stringent control. Sale and possession are restricted, with special prescription and record-keeping rules.

531. Schedule Y

Lays down guidelines for clinical trials of new drugs, including ethical requirements, documentation, and phases of trial.

532. Part XII B

Specifies requirements for manufacturing and sale of homeopathic medicines, including standards for potency, labelling, and packaging.

533. Schedule F

Relates to standards for biological and special products such as vaccines, sera, and toxins, including their storage, manufacturing, and testing conditions.

534. DMR (OA)

Drugs and Magic Remedies (Objectionable Advertisements) Act — prohibits misleading advertisements for drugs claiming to cure certain diseases or make exaggerated claims.

535. Wholesale Sale of Drugs

Involves sale of drugs to retailers, hospitals, or other institutions for resale or distribution, requiring a wholesale drug license.

536. Retail Sale of Drugs

Sale directly to consumers, which must be carried out by or under supervision of a registered pharmacist, with prescription control for scheduled drugs.

537. Restricted License

A license issued to dealers selling drugs not requiring the supervision of a qualified pharmacist, such as certain over-the-counter medicines.

538. Labelling of Drugs

The process of providing essential information on the drug container, including name, strength, expiry date, batch number, and warnings as per the rules.

539. Packing of Drugs

Regulations prescribing packaging standards to protect the drug from contamination, deterioration, and damage during handling and storage.

540. General Labelling Requirements

Basic mandatory details like generic name, brand name, net content, manufacturer details, batch number, manufacturing and expiry date, and statutory warnings.

541. Specimen Labels

Sample formats provided in rules showing how information should be presented on drug and cosmetic packaging for compliance.

542. List of Permitted Colours

Approved colouring agents for use in drugs and cosmetics, ensuring non-toxicity and safety for human use.

543. Offences – Labelling and Sale

Violations such as selling without license, improper labelling, selling expired drugs, or dealing in prohibited substances.

544. Penalties – Labelling and Sale

Legal consequences for offences, including fines, imprisonment, or cancellation of licenses, depending on the severity.

545. Drugs Technical Advisory Board (DTAB)

A statutory body advising the government on technical matters related to drug and cosmetic regulation.

546. Central Drugs Laboratory (CDL)

The national laboratory responsible for testing, analysis, and quality certification of drugs and cosmetics.

547. Drugs Consultative Committee (DCC)

A body to ensure uniform implementation of the Act and Rules across different states of India.

548. Government Drug Analysts

Experts appointed to analyze samples of drugs or cosmetics sent by inspectors or authorities for quality compliance.

549. Licensing Authorities

Officials authorized to issue, renew, and cancel licenses for drug import, manufacture, and sale.

550. Controlling Authorities

Senior officials overseeing the functioning of licensing authorities and drug inspectors to ensure proper enforcement.

551. Drugs Inspectors

Appointed officers empowered to inspect premises, take drug samples, verify compliance, and initiate legal action against violators.

552. Pharmacy Act, 1948

Central legislation to regulate the profession of pharmacy in India, focusing on education, registration, and professional conduct of pharmacists to ensure proper dispensing and compounding of medicines.

553. Objectives of Pharmacy Act

To regulate pharmacy education, maintain professional standards, register qualified pharmacists, and prohibit unqualified persons from practicing pharmacy.

554. Definitions (Pharmacy Act)

Covers legal meanings for terms like “Pharmacy,” “Pharmacist,” “Council,” “Registered Pharmacist,” which are crucial for interpretation of the Act.

555. Pharmacy Council of India (PCI)

Statutory body constituted under the Act to regulate pharmacy education and maintain the central register of pharmacists in India.

556. Constitution of PCI

Comprises members from the central and state governments, universities, medical councils, and elected pharmacy professionals.

557. Functions of PCI

Includes setting minimum educational standards, approving pharmacy institutions, framing Education Regulations, and maintaining uniformity across states.

558. Education Regulations

Rules framed by PCI prescribing minimum qualifications, course duration, curriculum, and examination systems for pharmacy courses.

559. State Pharmacy Council

Constituted in each state to maintain the register of pharmacists and regulate practice within the state.

560. Joint State Pharmacy Council

Formed by two or more states when separate state councils are not viable, to share resources and regulatory authority.

561. Registration of Pharmacists

Process by which qualified persons are enrolled in the official register to legally practice pharmacy.

562. Offences (Pharmacy Act)

Include falsely claiming to be a registered pharmacist, practicing without registration, or violating council regulations.

563. Penalties (Pharmacy Act)

Can include fines or imprisonment for offences, with severity depending on the nature of the violation.

564. Medicinal and Toilet Preparations (Excise Duties) Act, 1955

Regulates and levies excise duties on medicinal and toilet preparations containing alcohol, opium, or other narcotics.

565. Objectives of MTP Act

To control alcohol use in medicinal and toilet products, ensure proper licensing, and collect revenue.

566. Definitions (MTP Act)

Clarifies terms such as “medicinal preparation,” “toilet preparation,” “bonded manufactory,” and “duty.”

567. Licensing under MTP Act

Mandatory permit for manufacturing medicinal/toilet preparations, granted by excise authorities after inspection.

568. Manufacture in Bond

Production of alcohol-containing preparations under government supervision in bonded warehouses before duty payment.

569. Manufacture outside Bond

Production in licensed premises without bonded storage; duties are paid before manufacture.

570. Export of Alcoholic Preparations

Regulated export procedures ensuring compliance with customs and excise laws.

571. Manufacture of Ayurvedic, Homeopathic, Patent & Proprietary Preparations

Special provisions for traditional and proprietary medicines, often exempt from certain alcohol control measures if prescribed.

572. Offences (MTP Act)

Include manufacturing without license, evading duties, or producing substandard preparations.

573. Penalties (MTP Act)

May involve fines, confiscation of goods, and imprisonment for violations.

574. Narcotic Drugs and Psychotropic Substances Act, 1985 (NDPS Act)

Comprehensive law to prohibit, control, and regulate operations relating to narcotic drugs and psychotropic substances.

575. Objectives of NDPS Act

To combat drug abuse, regulate licit use, and punish illicit trafficking and manufacturing.

576. Definitions (NDPS Act)

Legal definitions for “narcotic drug,” “psychotropic substance,” “opium,” “cannabis,” and related terms.

577. Authorities and Officers (NDPS)

Includes Central Narcotics Bureau, state-level officers, and enforcement agencies for controlling narcotics.

578. Narcotic & Psychotropic Consultative Committee

Advisory body for the government on technical and policy matters relating to narcotics and psychotropics.

579. National Fund for Controlling Drug Abuse

Government fund used for prevention, rehabilitation, and awareness programs against drug abuse.

580. Prohibition, Control, and Regulation

Covers licensing, quotas, and restrictions on cultivation, production, manufacture, possession, and sale of narcotics.

581. Offences and Penalties (NDPS Act)

Severe punishments including long-term imprisonment and heavy fines for cultivation, trafficking, and illicit possession of narcotics.

582. Drugs and Magic Remedies (Objectionable Advertisements) Act, 1954

Central law regulating advertisements of drugs and remedies to prevent misleading claims and protect public health.

583. Objectives (DMR Act)

To prohibit advertisements that make false claims about curing diseases or enhancing bodily functions, and to safeguard vulnerable populations.

584. Definitions (DMR Act)

Legal meanings for “drug,” “magic remedy,” “advertisement,” and “disease,” essential for interpretation.

585. Prohibition of Certain Advertisements

Bans ads related to diagnosis, cure, or prevention of specific diseases listed in the Act’s schedule.

586. Classes of Exempted Advertisements

Includes government-approved educational material, scientific publications, and trade communications to healthcare professionals.

587. Offences (DMR Act)

Publishing, taking part in, or endorsing prohibited advertisements.

588. Penalties (DMR Act)

First offence may lead to imprisonment up to six months or fine; repeat offences have higher penalties.

589. Prevention of Cruelty to Animals Act, 1960

Legislation to prevent unnecessary pain or suffering to animals and regulate their use in experiments.

590. Objectives (PCA Act)

To ensure humane treatment of animals, regulate experimentation, and promote welfare.

591. Definitions (PCA Act)

Covers terms like “animal,” “experimentation,” “breeding,” and “institution.”

592. Institutional Animal Ethics Committee (IAEC)

Body in each research facility to review and approve animal experiment protocols.

593. CPCSEA Guidelines

Standards for care, housing, and handling of animals used in experiments.

594. Breeding and Stocking of Animals

Rules for licensed breeders to maintain healthy and genetically suitable animals for experiments.

595. Performance of Experiments

Mandates humane methods, minimal pain, and ethical justifications for all animal experiments.

596. Transfer and Acquisition of Animals

Requires official permissions and records for moving animals between facilities.

597. Records (PCA Act)

Institutions must maintain accurate logs of animal use, health status, and experiment outcomes.

598. Suspension or Revocation of Registration

Government can suspend/revoke licenses of institutions violating ethical standards.

599. Offences (PCA Act)

Cruel treatment, unlicensed breeding, or non-approved experiments.

600. Penalties (PCA Act)

Fines, cancellation of license, or imprisonment depending on severity.

601. National Pharmaceutical Pricing Authority (NPPA)

Government body regulating drug prices to ensure affordability and availability.

602. Drugs (Prices Control) Order, 2013 (DPCO)

Legal framework under which NPPA sets ceiling prices for essential medicines.

603. Objectives (DPCO 2013)

To control prices of scheduled drugs, prevent profiteering, and ensure equitable access.

604. Definitions (DPCO)

Includes “bulk drug,” “formulation,” “scheduled formulation,” “ceiling price,” etc.

605. Sale Price of Bulk Drugs

NPPA fixes sale prices for bulk drugs to control downstream formulation costs.

606. Retail Price of Formulations

Prices for finished dosage forms calculated using a cost-based formula under DPCO.

607. Ceiling Price of Scheduled Formulations

Maximum price manufacturers can charge for medicines listed in Schedule I of DPCO.

608. Retail Price of Non-scheduled Formulations

Not fixed by NPPA but monitored to prevent excessive annual increases.

609. National List of Essential Medicines (NLEM)

List of critical drugs prioritized for price control and guaranteed supply.

610. Offences (DPCO)

Selling above ceiling prices, non-compliance with NPPA orders, or failure to submit price returns.

611. Penalties (DPCO)

Recovery of overcharged amounts with interest and possible prosecution under Essential Commodities Act.

612. Pharmaceutical Legislations – Overview

Collection of laws, regulations, and guidelines governing the manufacture, distribution, sale, and use of drugs in India.

613. Drugs Enquiry Committee (1930)

Investigated problems in the Indian drug market and recommended legal controls to prevent spurious and substandard drugs.

614. Health Survey and Development Committee (Bhore Committee, 1943)

Proposed integration of preventive and curative services, rural health expansion, and better medical education.

615. Hathi Committee (1974)

Focused on drug policy, recommended self-reliance in bulk drug production, price control, and restriction on irrational fixed-dose combinations.

616. Mudaliar Committee (1961)

Reviewed public health development post-Bhore Committee, recommended strengthening district hospitals and public health programs.

617. Code of Pharmaceutical Ethics – Definition

Set of professional conduct rules for pharmacists to ensure ethical practice in all dealings.

618. Pharmacist in Relation to His Job

Duty to prepare and dispense medicines accurately, maintain proper records, and ensure drug quality.

619. Pharmacist in Relation to Trade

Should not encourage self-medication, should avoid substituting cheaper drugs without consent, and maintain fair pricing.

620. Pharmacist in Relation to Medical Profession

Must respect doctors' prescriptions, avoid criticism of other healthcare professionals, and maintain confidentiality.

621. Pharmacist in Relation to His Profession

Uphold dignity of the profession, contribute to knowledge, and follow laws and regulations.

622. Pharmacist's Oath

A solemn pledge to maintain honesty, service to humanity, and ethical standards in all professional activities.

623. Medical Termination of Pregnancy (MTP) Act, 1971

Law regulating conditions under which a pregnancy may be legally terminated in India.

624. Objectives (MTP Act)

To reduce maternal mortality and morbidity by providing safe abortion services under medical supervision.

625. Indications for MTP

Risk to mother's life, grave injury to physical/mental health, fetal abnormalities, pregnancy due to rape or contraceptive failure (in certain cases).

626. Gestational Limit (as amended)

Up to 20 weeks with approval of one registered medical practitioner; 20–24 weeks with approval of two RMPs for specific categories.

627. Approved Places for MTP

Hospitals established or maintained by government, or private facilities approved by the government.

628. Confidentiality Clause

Patient's identity and details must remain confidential under the Act.

629. Right to Information (RTI) Act, 2005

Empowers citizens to request information from public authorities to promote transparency and accountability.

630. Objectives (RTI)

To make government work more transparent, reduce corruption, and empower the public.

631. Applicability (RTI)

Covers all public authorities, including government-owned bodies, regulators, and certain funded NGOs.

632. Procedure for Seeking Information

Written or electronic application with prescribed fee, reply to be given within 30 days.

633. Exemptions under RTI

National security, personal information without public interest, cabinet papers, trade secrets.

634. Intellectual Property Rights (IPR) – Introduction

Legal rights granted to creators/inventors to protect their inventions, creations, and innovations.

635. Types of IPR

Patents, trademarks, copyrights, industrial designs, geographical indications, trade secrets.

636. Patents in Pharmaceuticals

Exclusive rights to manufacture and sell a new drug or process for a fixed period (usually 20 years).

637. TRIPS Agreement

WTO treaty that sets global standards for IPR, including in pharmaceuticals.

638. Importance of IPR in Pharmacy

Encourages innovation, rewards R&D investments, prevents unauthorized copying.

639. Patent Filing Process

Includes application, examination, publication, and grant stages.

640. Compulsory Licensing

Allows government to authorize production of a patented drug without owner's consent in public health emergencies.

641. Patent Infringement

Unauthorized making, using, or selling of a patented product or process.

SEM-VI

BP601T. MEDICINAL CHEMISTRY– III (Theory)

642. Antibiotics

Antibiotics are chemical substances produced by microorganisms or synthesized artificially to inhibit or kill bacteria and some other microbes. They work at low concentrations and have selective toxicity, meaning they target microbial cells without harming host cells significantly.

643. Historical Background of Antibiotics

The modern antibiotic era began in 1928 when Alexander Fleming discovered penicillin from *Penicillium notatum*. This discovery was followed by the mass production of penicillin during World War II. Streptomycin, tetracyclines, and cephalosporins later expanded the antibiotic spectrum.

644. Nomenclature of Antibiotics

Antibiotic names often derive from their source organism (e.g., Streptomycin from *Streptomyces*), chemical structure (e.g., β-lactams), or activity (e.g., aminoglycosides). The International Nonproprietary Name (INN) system standardizes names for global recognition.

645. Stereochemistry in Antibiotics

Stereochemistry refers to the 3D arrangement of atoms in antibiotic molecules, which directly influences their binding to bacterial targets. For example, β-lactams require specific stereochemical orientation to fit bacterial transpeptidase enzymes.

646. Structure–Activity Relationship (SAR)

SAR is the relationship between an antibiotic's chemical structure and its biological activity. Small changes in functional groups can enhance potency, stability, or spectrum, as seen in semi-synthetic penicillins.

647. Chemical Degradation of Antibiotics

Antibiotics may lose potency via hydrolysis, oxidation, photodegradation, or enzymatic breakdown. β-lactams are particularly prone to hydrolysis by β-lactamases.

648. Classification of Antibiotics

They can be classified by mechanism (cell wall synthesis inhibitors, protein synthesis

inhibitors), spectrum (broad/narrow), or structure (β-lactams, tetracyclines, aminoglycosides).

649. β-Lactam Ring

A four-membered lactam ring essential for antibacterial activity, targeting bacterial cell wall synthesis enzymes.

650. Penicillins – Overview

Naturally derived or semi-synthetic β-lactams active mainly against Gram-positive bacteria by inhibiting transpeptidase enzymes.

651. Penicillin SAR

Essential features include the β-lactam ring and thiazolidine ring; side chain modifications change spectrum and stability.

652. Cephalosporins – Overview

β-lactam antibiotics with a dihydrothiazine ring, broader Gram-negative coverage than penicillins, classified into generations.

653. Cephalosporin SAR

Changes at positions 3 and 7 of the nucleus affect β-lactamase resistance, spectrum, and pharmacokinetics.

654. β-Lactamase Inhibitors

Clavulanic acid, sulbactam, and tazobactam protect β-lactam antibiotics from enzymatic degradation.

655. Monobactams

β-lactam antibiotics with a monocyclic β-lactam ring; aztreonam targets Gram-negative aerobes and is β-lactamase resistant.

656. Aminoglycosides – Overview

Bactericidal agents that inhibit protein synthesis by binding the 30S ribosomal subunit, effective against aerobic Gram-negative bacilli.

657. Streptomycin

First aminoglycoside discovered, used against tuberculosis and plague; binds irreversibly to 30S ribosome.

658. Neomycin

Broad-spectrum aminoglycoside used topically due to toxicity; prevents protein chain initiation.

659. Kanamycin

Effective against resistant TB strains; inhibits mRNA decoding at the ribosome.

660. Aminoglycoside SAR

Amino sugars linked to a central aminocyclitol ring are essential; modifications affect ribosome binding and resistance.

661. Tetracycline – Overview

Broad-spectrum bacteriostatic antibiotic binding the 30S ribosome to block aminoacyl-tRNA binding.

662. Oxytetracycline

Naturally derived from *Streptomyces rimosus*, used in respiratory, skin, and urinary infections.

663. Minocycline

Semi-synthetic with improved lipid solubility and tissue penetration; used in acne and meningococcal prophylaxis.

664. Doxycycline

Highly bioavailable orally, longer half-life, effective in rickettsial, chlamydial, and malaria prophylaxis.

665. Tetracycline SAR

Four-ring naphthacene core essential; hydroxylation and methylation patterns affect activity and resistance.

666. Broad vs. Narrow Spectrum

Broad-spectrum antibiotics act on diverse bacteria; narrow-spectrum target specific groups.

667. Bactericidal vs. Bacteriostatic

Bactericidal kill bacteria; bacteriostatic inhibit growth, allowing immune clearance.

668. Resistance Mechanisms

Bacteria may inactivate drugs, alter targets, reduce uptake, or pump out antibiotics.

669. Combination Therapy

Using multiple antibiotics can broaden coverage, prevent resistance, or achieve synergy.

670. Adverse Effects of Antibiotics

Include allergic reactions, gastrointestinal upset, nephrotoxicity, ototoxicity, and superinfections.

671. Clinical Uses of Antibiotics

Treat bacterial infections, prevent post-surgical infections, and manage immunocompromised patients.

672. Chlortetracycline

A naturally occurring tetracycline antibiotic produced by *Streptomyces aureofaciens*. It inhibits bacterial protein synthesis by binding to the 30S ribosomal subunit, blocking aminoacyl-tRNA attachment. It has a broad spectrum but is now less used due to resistance and newer derivatives. Its chemical instability in strong acid or base leads to epimerization and degradation. SAR resembles tetracycline, with chlorine substitution enhancing activity against certain Gram-negative organisms.

673. Macrolide Antibiotics – Overview

Macrolides are bacteriostatic agents characterized by a large lactone ring (14–16 members) with attached sugars. They inhibit bacterial protein synthesis by binding to the 50S ribosomal subunit, blocking translocation. Active mainly against Gram-positive and atypical bacteria.

674. Erythromycin

A 14-membered macrolide derived from *Saccharopolyspora erythraea*. It blocks bacterial protein synthesis by binding to the 50S ribosome. Acid-labile; thus, enteric-coated formulations are used. Effective for respiratory infections, pertussis, and certain STDs.

675. Clarithromycin

A semi-synthetic derivative of erythromycin with a methyl group at position 6, improving acid stability and bioavailability. Used in respiratory tract infections and *Helicobacter pylori* eradication regimens.

676. Azithromycin

A 15-membered azalide macrolide with improved tissue penetration and long half-life.

Effective against respiratory infections, chlamydial infections, and some parasitic diseases.

677. Macrolide SAR

The lactone ring size and sugar substitutions affect ribosome binding and acid stability. Modifications can enhance bioavailability and broaden antimicrobial spectrum.

678. Chloramphenicol

A broad-spectrum antibiotic that inhibits bacterial protein synthesis by binding the 50S ribosomal subunit, blocking peptidyl transferase. Effective against Gram-positive, Gram-negative, and rickettsiae. Potential for aplastic anemia limits systemic use.

679. Clindamycin

A lincosamide antibiotic derived from lincomycin. It inhibits bacterial protein synthesis at the 50S subunit. Used in anaerobic infections and certain protozoal diseases.

680. Prodrugs – Definition

Pharmacologically inactive derivatives that undergo in vivo biotransformation to release the active drug. Designed to improve solubility, stability, absorption, or reduce toxicity.

681. Applications of Prodrug Design

Used to enhance oral bioavailability (e.g., ester prodrugs), prolong action (e.g., depot forms), reduce side effects, or achieve site-specific delivery.

682. Malaria – Etiology

A mosquito-borne infectious disease caused by *Plasmodium* species (*P. falciparum*, *P. vivax*, *P. ovale*, *P. malariae*). Transmitted via *Anopheles* mosquitoes, affecting red blood cells and causing cyclical fevers, anemia, and organ damage.

683. Quinolines – Overview

A class of synthetic and natural compounds containing a quinoline nucleus, widely used as antimalarials. They act mainly by interfering with heme detoxification in *Plasmodium* parasites.

684. Quinine Sulphate

An alkaloid from cinchona bark, effective against erythrocytic stages of *Plasmodium*. Also used for nocturnal leg cramps. SAR: quinoline nucleus essential for antimalarial activity.

685. Chloroquine

A synthetic 4-aminoquinoline; inhibits heme polymerization in parasite food vacuoles, leading to toxic heme accumulation. Used for treatment and prophylaxis of malaria.

686. Amodiaquine

Similar to chloroquine but retains activity against some chloroquine-resistant strains. May cause hepatotoxicity and agranulocytosis.

687. Primaquine Phosphate

An 8-aminoquinoline active against liver stages and gametocytes of *Plasmodium*. Prevents relapse in *P. vivax* and *P. ovale* malaria.

688. Pamaquine

An older 8-aminoquinoline, now rarely used due to toxicity. Targets hypnozoites in the liver.

689. Quinacrine Hydrochloride

A synthetic acridine derivative used historically in malaria but now limited due to adverse effects.

690. Mefloquine

A quinoline-methanol compound effective against chloroquine-resistant *P. falciparum*. Long half-life allows weekly dosing but may cause neuropsychiatric effects.

691. Cycloguanil Pamoate

The active metabolite of proguanil; inhibits dihydrofolate reductase, blocking parasite DNA synthesis.

692. Proguanil

A biguanide prodrug converted to cycloguanil. Used in malaria prophylaxis, often with atovaquone.

693. Pyrimethamine

A dihydrofolate reductase inhibitor with slow parasite clearance. Used with sulfonamides for synergistic effect.

694. Artesunate

A water-soluble artemisinin derivative, rapidly acting against all *P. falciparum* blood stages.

695. Artemether

A lipid-soluble artemisinin derivative used in combination therapies for resistant malaria.

696. Atovaquone

A hydroxy-naphthoquinone inhibiting mitochondrial electron transport in *Plasmodium*. Often combined with proguanil.

697. Quinolines SAR

The quinoline ring system with specific substitutions influences activity, resistance profile, and toxicity.

698. Artemisinin Mechanism

Contains an endoperoxide bridge that generates reactive oxygen species inside parasites, causing membrane damage.

699. Combination Antimalarial Therapy

Combines drugs with different mechanisms to prevent resistance (e.g., artemisinin-based combinations).

700. Antimalarial Resistance

Caused by mutations in parasite transport proteins or enzymes; major problem in *P. falciparum*.

701. Adverse Effects of Antimalarials

Include gastrointestinal upset, neuropsychiatric effects (mefloquine), retinopathy (chloroquine), hemolysis in G6PD deficiency (primaquine).

702. Isoniazid (INH)

Isoniazid is a first-line anti-tubercular drug effective against *Mycobacterium tuberculosis*. It inhibits mycolic acid synthesis, an essential component of the bacterial cell wall. Administered orally, it is bactericidal for actively dividing bacilli and bacteriostatic for dormant ones. Adverse effects include hepatotoxicity, peripheral neuropathy (preventable with pyridoxine), and hypersensitivity reactions. Resistance develops via mutations in the *katG* or *inhA* genes.

703. Ethionamide

Ethionamide is a second-line bacteriostatic drug for tuberculosis, structurally related to isoniazid. It blocks mycolic acid synthesis by inhibiting the enzyme *enoyl-ACP reductase*. It is used in multidrug-resistant TB (MDR-TB) and leprosy cases. Side effects include gastrointestinal irritation, hepatotoxicity, neurotoxicity, and hypothyroidism. Resistance arises from mutations in the *ethA* gene, which encodes its activating enzyme.

704. Ethambutol

Ethambutol is a first-line anti-TB drug that inhibits *arabinosyl transferase*, preventing arabinogalactan polymerization in the mycobacterial cell wall. It is bacteriostatic and effective against both drug-sensitive and drug-resistant strains. Major adverse effect is optic neuritis, leading to reversible loss of red-green color discrimination. It is always used in combination therapy to prevent resistance.

705. Pyrazinamide

Pyrazinamide is a prodrug converted to pyrazinoic acid by mycobacterial pyrazinamidase. It disrupts membrane transport and energy production in acidic pH within macrophages. It is bactericidal against dormant bacilli in lesions. Side effects include hepatotoxicity, hyperuricemia, and arthralgia. Resistance develops due to mutations in the *pncA* gene encoding pyrazinamidase.

706. Para-aminosalicylic acid (PAS)

PAS is a second-line bacteriostatic anti-TB drug that inhibits folate synthesis by competing with para-aminobenzoic acid (PABA). It is primarily used in drug-resistant tuberculosis. Common adverse effects are gastrointestinal upset, hypersensitivity reactions, and hepatotoxicity. It has a structural resemblance to sulfonamides but is less potent.

707. Rifampicin

Rifampicin is a bactericidal anti-TB antibiotic that inhibits DNA-dependent RNA polymerase, blocking RNA synthesis. It has a broad spectrum, also active against leprosy and some Gram-positive and Gram-negative bacteria. Adverse effects include hepatotoxicity, flu-like syndrome, and orange-red discoloration of body fluids. Resistance arises from mutations in the *rpoB* gene.

708. Rifabutin

Rifabutin is a rifamycin derivative with similar mechanism to rifampicin but better activity against *Mycobacterium avium complex* (MAC). It is used in TB patients with HIV to avoid drug interactions with antiretrovirals. Common side effects include uveitis, rash, and gastrointestinal upset. It induces hepatic enzymes but to a lesser extent than rifampicin.

709. Cycloserine

Cycloserine is a second-line anti-TB antibiotic that inhibits bacterial cell wall synthesis by blocking *alanine racemase* and *D-alanine-D-alanine ligase*. It is bacteriostatic or bactericidal depending on concentration. Adverse effects are mainly neurological, including headache, tremors, and psychosis, which can be reduced with pyridoxine supplementation.

710. Streptomycin

Streptomycin is an aminoglycoside antibiotic that inhibits protein synthesis by binding to the 30S ribosomal subunit, causing misreading of mRNA. It is used in severe TB cases, especially meningitis. Adverse effects include ototoxicity (vestibular and auditory) and nephrotoxicity. Resistance occurs via ribosomal mutations.

711. Capreomycin sulphate

Capreomycin is a cyclic peptide antibiotic used in multidrug-resistant TB. It inhibits protein synthesis by binding to the 70S ribosome. Side effects include nephrotoxicity, ototoxicity, and electrolyte imbalances. It is given intramuscularly and often used in combination to prevent resistance.

712. Nalidixic Acid

Nalidixic acid is a first-generation quinolone that inhibits bacterial DNA gyrase, preventing DNA replication. It is mainly used for urinary tract infections caused by Gram-negative bacteria. Adverse effects include gastrointestinal upset, rash, and CNS disturbances like dizziness. Resistance develops rapidly, limiting its use.

713. Ciprofloxacin

Ciprofloxacin is a second-generation fluoroquinolone that inhibits DNA gyrase and topoisomerase IV, interfering with bacterial DNA replication and transcription. It is broad-spectrum and used for UTIs, respiratory, gastrointestinal, and bone infections. Side effects include tendinitis, CNS effects, and photosensitivity.

714. Nitrofurantoin

Nitrofurantoin is a urinary antiseptic that damages bacterial DNA after enzymatic reduction inside bacteria. It is mainly used for prophylaxis and treatment of uncomplicated UTIs. Common side effects are gastrointestinal upset, pulmonary fibrosis (long-term), and hemolytic anemia in G6PD deficiency.

715. Acyclovir

Acyclovir is an antiviral drug active against herpes simplex virus (HSV) and varicella-zoster virus (VZV). It is a guanine analogue activated by viral thymidine kinase, inhibiting viral DNA polymerase. Side effects include nephrotoxicity (crystalluria) and neurotoxicity at high doses.

716. Zidovudine (AZT)

Zidovudine is a nucleoside reverse transcriptase inhibitor (NRTI) used in HIV treatment. It inhibits viral reverse transcriptase, preventing conversion of viral RNA into DNA. Side effects include bone marrow suppression, myopathy, and lactic acidosis.

717. Lamivudine

Lamivudine is an NRTI used in HIV and hepatitis B virus (HBV) treatment. It inhibits viral reverse transcriptase and DNA polymerase. It has good oral bioavailability and minimal toxicity but may cause headache and gastrointestinal upset.

718. Ritonavir

Ritonavir is an HIV protease inhibitor that prevents cleavage of viral polyproteins into functional proteins. It is often used in low doses to boost other protease inhibitors via CYP3A4 inhibition. Side effects include gastrointestinal upset, hyperlipidemia, and insulin resistance.

719. Saquinavir

Saquinavir is a protease inhibitor used in combination antiretroviral therapy for HIV. It blocks viral protease, preventing maturation of infectious virions. Common adverse effects include gastrointestinal disturbances and metabolic changes like hyperglycemia.

720. Ribavirin

Ribavirin is a broad-spectrum antiviral used for hepatitis C (with interferon) and severe RSV infections. It inhibits viral RNA synthesis and mRNA capping. Side effects include hemolytic anemia and teratogenicity.

721. Amantadine

Amantadine is an antiviral drug effective against influenza A virus by blocking the M2 ion channel, preventing viral uncoating. It also has antiparkinsonian activity by increasing dopamine release. Side effects include CNS stimulation, insomnia, and livedo reticularis.

722. Amphotericin-B

A polyene antifungal antibiotic used to treat systemic fungal infections like aspergillosis, candidiasis, and cryptococcosis. It binds to ergosterol in fungal cell membranes, creating pores that cause leakage of cellular contents. Administered intravenously due to poor oral

absorption, it has broad-spectrum antifungal activity but significant nephrotoxicity. Liposomal formulations reduce toxicity.

723. Nystatin

A polyene antifungal mainly used topically or orally for treating candidiasis of skin, mouth, and intestines. It binds to ergosterol in fungal membranes, increasing permeability and causing cell death. Poorly absorbed from the gastrointestinal tract, making it suitable for localized GI infections. It is safe for prolonged use due to minimal systemic absorption.

724. Natamycin

A polyene antifungal used in ophthalmic preparations for fungal keratitis and conjunctivitis. It disrupts fungal cell membrane integrity by binding to ergosterol. It is also used as a food preservative to prevent mold growth. Has a broad antifungal spectrum and low toxicity because it is not absorbed systemically in significant amounts.

725. Griseofulvin

An antifungal antibiotic used for dermatophyte infections like ringworm and athlete's foot. It works by inhibiting fungal cell mitosis through disruption of microtubule function. Taken orally and accumulates in keratinized tissues like hair, skin, and nails, making it effective for chronic infections. Absorption is enhanced with fatty meals.

726. Clotrimazole

An imidazole antifungal agent used topically for skin and mucosal infections like athlete's foot, candidiasis, and tinea. It inhibits ergosterol synthesis in fungal membranes, disrupting structure and function. Available as creams, lotions, and lozenges. It has broad activity and low toxicity when applied topically.

727. Econazole

An imidazole derivative used topically for dermatophyte and yeast infections. It interferes with ergosterol synthesis, leading to membrane damage and fungal death. Effective against both dermatophytes and Candida species. Commonly available in cream formulations for skin infections and vaginal preparations for candidiasis.

728. Miconazole

An imidazole antifungal used topically and intravaginally for infections caused by dermatophytes and Candida. It inhibits fungal cytochrome P450 enzymes, blocking

ergosterol synthesis. Also has some antibacterial activity against Gram-positive bacteria. Minimal systemic absorption reduces toxicity risk.

729. Ketoconazole

An imidazole antifungal available in oral and topical forms. It inhibits ergosterol biosynthesis by blocking fungal cytochrome P450 enzymes. Effective for systemic and superficial fungal infections but oral use is limited by hepatotoxicity and drug interactions. Topical formulations are widely used for skin and scalp infections.

730. Itraconazole

A triazole antifungal with broad activity against systemic mycoses. It inhibits fungal cell membrane synthesis by blocking ergosterol formation. Preferred for infections like histoplasmosis, blastomycosis, and aspergillosis. Better tolerated than ketoconazole and has fewer endocrine side effects, but still requires monitoring for liver toxicity.

731. Fluconazole

A triazole antifungal effective against Candida, Cryptococcus, and certain dimorphic fungi. It inhibits fungal cytochrome P450 enzymes, reducing ergosterol levels. Well absorbed orally, penetrates cerebrospinal fluid, making it useful for cryptococcal meningitis. Has fewer drug interactions compared to other azoles.

732. Metronidazole

A nitroimidazole antibiotic effective against anaerobic bacteria and protozoa. It is reduced inside susceptible organisms to form reactive radicals that damage DNA. Used for amoebiasis, giardiasis, trichomoniasis, and anaerobic infections. Side effects include metallic taste and disulfiram-like reaction with alcohol.

733. Tinidazole

A nitroimidazole similar to metronidazole, but with a longer half-life allowing single-dose therapy for some infections. Used for protozoal diseases like amoebiasis, giardiasis, and trichomoniasis, and for anaerobic bacterial infections. Well tolerated, with fewer gastrointestinal side effects.

734. Diethylcarbamazine Citrate

An antihelmintic drug used for filariasis and loiasis. It immobilizes and damages microfilariae, making them susceptible to immune destruction. Usually given orally, it is

effective against both microfilariae and some adult worms. Common side effects include headache, dizziness, and allergic reactions due to parasite death.

735. Mebendazole

A broad-spectrum antihelmintic effective against intestinal worms like roundworms, hookworms, and whipworms. It inhibits microtubule synthesis in worms, impairing glucose uptake and leading to energy depletion. Poorly absorbed, making it ideal for intestinal infections. Well tolerated with minimal systemic effects.

736. Tolnaftate

A topical antifungal used for dermatophyte infections such as athlete's foot and ringworm. It inhibits squalene epoxidase, blocking ergosterol synthesis and compromising fungal cell membranes. Often used in powder or cream forms for skin infections and prevention in athletes.

737. Dapsone

A sulfone antimicrobial with anti-inflammatory properties. Used in leprosy, dermatitis herpetiformis, and Pneumocystis jirovecii pneumonia. It inhibits dihydropteroate synthase in folate metabolism. Side effects include hemolysis in G6PD-deficient patients and methemoglobinemia.

738. Sulfacetamide

A sulfonamide antibacterial used mainly in ophthalmic preparations for bacterial conjunctivitis and blepharitis. It inhibits bacterial folate synthesis by blocking dihydropteroate synthase. Well tolerated when used topically, with minimal systemic absorption.

739. Sulfamethoxazole

A sulfonamide antibiotic often combined with trimethoprim (co-trimoxazole). It inhibits bacterial folate synthesis, while trimethoprim blocks dihydrofolate reductase, creating a synergistic effect. Effective against urinary tract infections, respiratory infections, and certain gastrointestinal infections.

740. Trimethoprim

An antibacterial that inhibits bacterial dihydrofolate reductase, blocking folic acid synthesis. Commonly combined with sulfamethoxazole for synergistic bactericidal

action. Used in urinary tract infections, respiratory tract infections, and Pneumocystis pneumonia.

741. Cotrimoxazole

A fixed-dose combination of sulfamethoxazole and trimethoprim. It blocks two steps in bacterial folate synthesis, giving broad-spectrum coverage. Used in urinary tract infections, Pneumocystis pneumonia, toxoplasmosis, and respiratory tract infections.

742. Drug Design

Drug design is the process of discovering new medications by predicting how a chemical structure will interact with a biological target. It uses knowledge of the disease mechanism and molecular biology to create molecules with desired therapeutic effects. Modern drug design often applies computational tools to predict binding affinity, optimize potency, and reduce side effects before synthesis.

743. Structure-Based Drug Design (SBDD)

A method that relies on the 3D structure of the biological target, often obtained from X-ray crystallography or NMR. The drug candidate is designed to fit precisely into the active site, maximizing interactions like hydrogen bonding and hydrophobic contacts. This approach is especially useful in enzyme inhibitors and receptor antagonists.

744. Ligand-Based Drug Design (LBDD)

Used when the target's 3D structure is unknown. It depends on information from known ligands that bind to the target. By analyzing common features in these ligands, new molecules are designed to mimic or improve their activity. Pharmacophore mapping is a key part of this approach.

745. Partition Coefficient (log P)

A measure of a compound's lipophilicity, representing its distribution between a non-polar solvent (octanol) and water. In QSAR, log P helps predict a drug's absorption, distribution, and membrane permeability. Optimal log P values indicate good balance between solubility in lipids and water, influencing bioavailability.

746. Hammett's Electronic Parameter (σ)

A substituent constant that quantifies the electron-withdrawing or electron-donating effects of groups attached to an aromatic ring. It is used in QSAR to relate chemical

structure changes to biological activity or reaction rates. Positive σ values indicate electron-withdrawing effects; negative values indicate electron-donating effects.

747. Taft's Steric Parameter (Es)

A value representing the spatial or size effect of a substituent on a molecule. It helps understand how bulky groups affect enzyme binding or reaction rates. Larger steric values may hinder binding by creating crowding, while optimal sizes may improve fit into binding sites.

748. Hansch Analysis

A QSAR method combining physicochemical parameters such as log P, σ, and Es into a mathematical equation that correlates structure with biological activity. It helps predict the potency of new compounds by identifying the contribution of hydrophobic, electronic, and steric effects.

749. Quantitative Structure-Activity Relationship (QSAR)

A statistical method that relates chemical structure descriptors to biological activity. By analyzing known compounds, QSAR models can predict the activity of new molecules before synthesis. It reduces experimental costs and speeds up drug discovery.

750. Pharmacophore

An abstract description of the essential features in a molecule required for biological activity, such as hydrogen bond donors, acceptors, hydrophobic regions, and aromatic rings. Pharmacophores are used in virtual screening to find new compounds with similar activity.

751. Pharmacophore Modeling

The process of identifying and arranging essential molecular features required for optimal target binding. It is used to guide the design of new drugs or to search databases for compounds with the same pharmacophore features.

752. Molecular Docking

A computational technique used to predict the preferred orientation of a small molecule when bound to a target protein. It estimates binding affinity and helps optimize molecular interactions for better potency.

753. Combinatorial Chemistry

A method that rapidly produces a large number of related compounds by combining sets

of building blocks in different ways. It allows quick exploration of chemical diversity to find potential drug candidates.

754. Solid-Phase Synthesis

A technique in combinatorial chemistry where molecules are built on a solid support, such as resin beads. This simplifies purification since excess reagents can be washed away, making it ideal for peptides and oligonucleotides.

755. Solution-Phase Synthesis

A combinatorial chemistry method where molecules are synthesized in solution rather than on a solid support. It allows more reaction types but requires more complex purification steps.

756. Lead Compound

A chemical compound with promising biological activity that serves as the starting point for optimization in drug design. Leads are refined to improve potency, selectivity, and pharmacokinetic properties.

757. Lead Optimization

The process of chemically modifying a lead compound to improve its effectiveness, selectivity, safety, and pharmacokinetics while minimizing toxicity. It is a critical step before preclinical testing.

758. Lipinski's Rule of Five

A set of guidelines predicting oral drug-likeness. It states that poor absorption is likely if a compound has more than 5 hydrogen bond donors, 10 hydrogen bond acceptors, molecular weight above 500, or log P above 5.

759. Molecular Descriptors

Numerical values that describe molecular properties such as size, shape, hydrophobicity, and electronic distribution. They are used in QSAR modeling to relate chemical structure to activity.

760. Virtual Screening

A computer-based method of searching large chemical libraries to identify compounds likely to bind to a biological target. It reduces the need for expensive and time-consuming lab screening.

761. Docking Score

A numerical value generated in molecular docking that predicts the strength of binding between the ligand and the target. Lower (more negative) scores generally indicate stronger predicted binding affinity.

BP602 T. PHARMACOLOGY-III (Theory)

762. Anti-Asthmatic Drugs

Medications used to prevent or relieve asthma symptoms by reducing airway inflammation, relaxing bronchial smooth muscles, and improving airflow. They include bronchodilators (β_2-agonists, anticholinergics) and anti-inflammatory agents (corticosteroids, leukotriene antagonists). The choice depends on the severity and frequency of attacks, with inhalation routes preferred for rapid and targeted action.

763. β_2-Adrenergic Agonists

A class of bronchodilators that activate β_2-receptors in airway smooth muscle, leading to relaxation and widened airways. They are used for quick relief in asthma and COPD. Examples include salbutamol (short-acting) and salmeterol (long-acting). Overuse may cause tremors, tachycardia, and tolerance.

764. Anticholinergic Bronchodilators

These block muscarinic receptors in the airway, preventing acetylcholine-mediated bronchoconstriction. Used in COPD and sometimes asthma, they reduce mucus secretion and improve airflow. Examples: Ipratropium and Tiotropium. They are particularly useful in patients intolerant to β_2-agonists.

765. Leukotriene Receptor Antagonists (LTRAs)

Oral anti-asthmatic drugs that block leukotriene receptors, reducing inflammation, bronchoconstriction, and mucus secretion. Useful in mild persistent asthma and allergic rhinitis. Example: Montelukast. They are often adjuncts to inhaled corticosteroids.

766. Methylxanthines

Bronchodilators like theophylline that inhibit phosphodiesterase, increasing cAMP and causing smooth muscle relaxation. They also have mild anti-inflammatory effects. Narrow therapeutic index requires blood-level monitoring. Adverse effects include insomnia, nausea, and arrhythmias.

767. Drugs for COPD

Include bronchodilators (β_2-agonists, anticholinergics), inhaled corticosteroids, and phosphodiesterase-4 inhibitors. They aim to improve symptoms, reduce exacerbations,

and enhance quality of life. Therapy is individualized based on severity and GOLD classification.

768. Expectorants

Agents that increase bronchial secretion or decrease mucus viscosity, facilitating mucus clearance from airways. Examples: Guaifenesin and potassium iodide. They are useful in productive cough to ease expectoration.

769. Antitussives

Drugs that suppress cough reflex, used mainly for dry, non-productive cough. Central agents like codeine act on the cough center in the medulla; peripheral agents reduce airway irritation. Excessive suppression may lead to secretion retention.

770. Nasal Decongestants

Drugs that constrict nasal mucosal blood vessels via α-adrenergic stimulation, reducing swelling and mucus production. Used for nasal congestion in colds, allergies, and sinusitis. Examples: Oxymetazoline, pseudoephedrine. Prolonged use can cause rebound congestion.

771. Respiratory Stimulants

Agents that increase the rate or depth of breathing by stimulating respiratory centers in the brainstem. Used in respiratory depression from drug overdose or apnea. Examples: Doxapram, caffeine in neonates.

772. Antiulcer Agents

Medications that reduce gastric acid secretion or protect the gastric mucosa. Includes proton pump inhibitors (PPIs), H_2-receptor antagonists, antacids, and cytoprotective drugs. Used in peptic ulcer disease, GERD, and gastritis.

773. Proton Pump Inhibitors (PPIs)

Irreversibly block the H^+/K^+-ATPase pump in parietal cells, leading to profound suppression of gastric acid secretion. Examples: Omeprazole, pantoprazole. Effective in ulcers, GERD, and Zollinger-Ellison syndrome.

774. H_2-Receptor Antagonists

Block histamine H_2-receptors in the stomach lining, reducing acid production. Examples: Ranitidine, famotidine. They are less potent than PPIs but useful for mild acid-related disorders.

775. Antacids

Alkaline substances that neutralize stomach acid, providing rapid symptom relief in indigestion and mild GERD. Examples: Magnesium hydroxide, aluminum hydroxide. Overuse may cause electrolyte imbalance.

776. Drugs for Constipation

Include bulk-forming agents, osmotic laxatives, stimulant laxatives, and stool softeners. They work by increasing stool bulk, drawing water into the bowel, or stimulating intestinal motility. Choice depends on cause and urgency.

777. Drugs for Diarrhoea

Include oral rehydration therapy, antimotility agents (loperamide), adsorbents, and antibiotics if infectious. Treatment aims to prevent dehydration and restore normal bowel function.

778. Appetite Stimulants

Medications that increase appetite, often used in cachexia or anorexia. Examples: Cyproheptadine, megestrol acetate. They work by influencing hypothalamic appetite centers or hormonal pathways.

779. Appetite Suppressants

Agents that reduce hunger, used in obesity management. They act on the central nervous system to decrease appetite or increase satiety. Examples: Phentermine, orlistat (fat absorption inhibitor).

780. Digestants

Substances containing enzymes that aid digestion of food components, such as proteases, lipases, and amylases. They help in digestive enzyme deficiencies like pancreatic insufficiency. Example: Pancreatin.

781. Carminatives

Herbal or synthetic agents that relieve flatulence by reducing gas formation or promoting gas expulsion. Examples: Peppermint oil, fennel. They may act by relaxing gastrointestinal smooth muscle.

782. Chemotherapy

The use of chemical substances to destroy or inhibit the growth of microorganisms, parasites, or cancer cells without causing significant damage to host tissues. It relies on

selective toxicity, where the drug targets unique features of the pathogen or cancer cell, sparing normal cells. Examples include antibacterial, antiviral, antifungal, antiparasitic, and anticancer agents.

783. General Principles of Chemotherapy

Effective chemotherapy depends on factors such as selective toxicity, minimal host toxicity, optimal dosage, adequate duration, prevention of resistance, and drug combinations. Understanding pathogen biology and pharmacokinetics helps in selecting appropriate drugs and reducing side effects.

784. Selective Toxicity

A principle where a drug is toxic to the target microorganism or cancer cell but relatively harmless to the host. This is achieved by targeting structures or enzymes absent in human cells, such as bacterial cell walls or specific metabolic pathways.

785. Sulfonamides

Synthetic antibacterial agents that inhibit bacterial folic acid synthesis by competing with para-aminobenzoic acid (PABA) for dihydropteroate synthase. They are broad-spectrum and used for urinary tract infections, burns, and certain systemic infections. Example: Sulfamethoxazole.

786. Cotrimoxazole

A synergistic combination of sulfamethoxazole and trimethoprim, inhibiting sequential steps in folic acid synthesis. It provides broad-spectrum activity against gram-positive and gram-negative bacteria and is used for urinary tract infections, respiratory infections, and Pneumocystis pneumonia.

787. Penicillins

β-lactam antibiotics that inhibit bacterial cell wall synthesis by binding to penicillin-binding proteins, leading to cell lysis. Effective mainly against gram-positive bacteria. Examples: Penicillin G, amoxicillin. Resistance can occur through β-lactamase production.

788. Cephalosporins

β-lactam antibiotics with a broader spectrum and greater β-lactamase resistance than penicillins. Classified into generations with varying gram-positive and gram-negative coverage. Used in respiratory, urinary, skin, and bloodstream infections.

789. Chloramphenicol

A broad-spectrum antibiotic that inhibits bacterial protein synthesis by binding to the 50S ribosomal subunit. Effective against serious infections like typhoid fever but limited due to potential aplastic anemia and bone marrow suppression.

790. Macrolides

Antibiotics that bind to the 50S ribosomal subunit, inhibiting protein synthesis. Effective against gram-positive cocci and atypical pathogens. Examples: Erythromycin, azithromycin. Used for respiratory, skin, and sexually transmitted infections.

791. Quinolones

Synthetic antibacterial agents that inhibit bacterial DNA gyrase, preventing DNA replication. Early quinolones like nalidixic acid are mainly active against gram-negative urinary pathogens.

792. Fluoroquinolones

A more potent class of quinolones with a fluorine atom, increasing spectrum and potency. Inhibit DNA gyrase and topoisomerase IV. Examples: Ciprofloxacin, levofloxacin. Used in respiratory, urinary, and gastrointestinal infections.

793. Tetracyclines

Broad-spectrum antibiotics that inhibit protein synthesis by binding to the 30S ribosomal subunit, blocking tRNA attachment. Effective against gram-positive, gram-negative, and atypical organisms. Examples: Doxycycline, minocycline. Resistance can occur via efflux pumps.

794. Aminoglycosides

Bactericidal antibiotics that bind irreversibly to the 30S ribosomal subunit, causing misreading of mRNA. Effective mainly against aerobic gram-negative bacteria. Examples: Gentamicin, amikacin. Potentially nephrotoxic and ototoxic.

795. Bactericidal Agents

Antimicrobial drugs that kill bacteria directly rather than merely inhibiting growth. Examples: β-lactams, aminoglycosides, fluoroquinolones. Preferred in life-threatening infections.

796. Bacteriostatic Agents

Drugs that inhibit bacterial growth and reproduction, allowing the immune system to

eliminate the pathogen. Examples: Tetracyclines, chloramphenicol, macrolides. Not suitable for immunocompromised patients.

797. Antimicrobial Resistance

The ability of microorganisms to withstand drug effects, often due to genetic mutations or acquiring resistance genes. Mechanisms include enzyme production, altered drug targets, and decreased permeability.

798. Combination Chemotherapy

Using two or more antimicrobial agents together to broaden spectrum, prevent resistance, or achieve synergistic effects. Examples: Penicillin + gentamicin for enterococcal endocarditis.

799. Post-Antibiotic Effect (PAE)

The persistent suppression of bacterial growth after limited exposure to an antibiotic. Seen with aminoglycosides and fluoroquinolones, allowing less frequent dosing.

800. β-Lactamase Inhibitors

Compounds like clavulanic acid that block β-lactamase enzymes, restoring β-lactam antibiotic activity. Used in combination with penicillins (e.g., amoxicillin-clavulanate).

801. Spectrum of Activity

The range of bacteria susceptible to a particular antimicrobial agent. Narrow-spectrum drugs target specific bacteria, while broad-spectrum agents cover multiple groups.

802. Antitubercular Agents

Drugs used to treat tuberculosis by targeting *Mycobacterium tuberculosis*. Common first-line agents include isoniazid, rifampicin, ethambutol, and pyrazinamide. They act by inhibiting cell wall synthesis, RNA synthesis, or other essential bacterial processes. Treatment is prolonged to prevent resistance and relapse.

803. Isoniazid

A bactericidal antitubercular drug that inhibits mycolic acid synthesis in *Mycobacterium tuberculosis* cell walls. It is highly specific and used as first-line therapy. Requires monitoring for hepatotoxicity and peripheral neuropathy.

804. Rifampicin

An antibiotic that inhibits bacterial DNA-dependent RNA polymerase, suppressing RNA

synthesis. Used in tuberculosis and leprosy. It induces liver enzymes and can cause orange discoloration of body fluids.

805. Antileprotic Agents

Drugs used to treat leprosy caused by *Mycobacterium leprae*. Common agents include dapsone, rifampicin, and clofazimine. Therapy is prolonged and combined to prevent resistance.

806. Dapsone

A sulfone antibiotic inhibiting folic acid synthesis in *M. leprae*. It has bacteriostatic activity and is used in multi-drug therapy for leprosy. Side effects include hemolysis, especially in G6PD-deficient patients.

807. Antifungal Agents

Drugs that treat fungal infections by targeting fungal cell membranes or nucleic acids. Examples include amphotericin B (binds ergosterol), azoles (inhibit ergosterol synthesis), and griseofulvin (disrupts mitosis).

808. Amphotericin B

A polyene antifungal that binds ergosterol in fungal membranes, creating pores that cause cell death. Used for serious systemic fungal infections. Side effects include nephrotoxicity and infusion reactions.

809. Azole Antifungals

Synthetic antifungals like fluconazole and ketoconazole that inhibit lanosterol 14-α-demethylase, blocking ergosterol synthesis and compromising fungal cell membrane integrity.

810. Antiviral Drugs

Medications that inhibit viral replication by targeting viral enzymes or entry into host cells. Examples include acyclovir (herpes), zidovudine (HIV), and oseltamivir (influenza).

811. Acyclovir

A nucleoside analog activated by viral thymidine kinase to inhibit viral DNA polymerase. Effective against herpes simplex and varicella-zoster viruses with minimal toxicity.

812. Anthelmintics

Drugs that eradicate parasitic worms by disrupting their energy metabolism or neuromuscular function. Examples include albendazole, mebendazole, and ivermectin.

813. Albendazole

A broad-spectrum anthelmintic that inhibits microtubule formation in parasites, leading to energy depletion and death. Used for roundworm, hookworm, and tapeworm infections.

814. Antimalarial Drugs

Agents that treat malaria by targeting the *Plasmodium* parasite. Classes include quinolines, antifolates, and artemisinins. Therapy is tailored by species and resistance patterns.

815. Chloroquine

A quinoline antimalarial that interferes with heme detoxification in *Plasmodium*, causing toxic heme accumulation. Used for prophylaxis and treatment of sensitive malaria strains.

816. Artemisinin

A sesquiterpene lactone that generates reactive oxygen species in parasites, causing rapid parasite clearance. Used in combination therapies for resistant malaria.

817. Antiamoebic Agents

Drugs that treat amoebiasis caused by *Entamoeba histolytica*. Includes metronidazole for invasive disease and diloxanide furoate for luminal infection.

818. Metronidazole

An antimicrobial effective against anaerobic protozoa and bacteria. It generates free radicals causing DNA damage in target organisms. Used for amoebiasis, giardiasis, and bacterial vaginosis.

819. Sulfonamides in Chemotherapy

These synthetic drugs inhibit bacterial folic acid synthesis and are sometimes used in combination with trimethoprim (cotrimoxazole) for protozoal infections and bacterial diseases.

820. Prophylactic Chemotherapy

Use of antimicrobial agents to prevent infection in high-risk individuals, such as travelers to malaria-endemic areas or patients undergoing surgery.

821. Combination Therapy in Chemotherapy

Using multiple drugs simultaneously to increase efficacy, prevent resistance, and target different stages of pathogen lifecycle. Essential in tuberculosis, leprosy, and malaria treatment.

822. Urinary Tract Infections (UTIs)

Infections of the urinary tract caused mostly by bacteria like *E. coli*. Symptoms include dysuria, frequency, and urgency. Treatment involves antibiotics such as nitrofurantoin, ciprofloxacin, and trimethoprim. Proper diagnosis and antibiotic sensitivity testing help prevent resistance.

823. Nitrofurantoin

An antibiotic used for uncomplicated UTIs. It acts by damaging bacterial DNA through reactive intermediates. Effective against common urinary pathogens with minimal systemic effects due to rapid urinary excretion.

824. Sexually Transmitted Diseases (STDs)

Infections transmitted through sexual contact, caused by bacteria, viruses, or parasites. Examples include syphilis (*Treponema pallidum*), gonorrhea (*Neisseria gonorrhoeae*), chlamydia, and HIV. Treatment varies with the causative agent and includes antibiotics and antivirals.

825. Syphilis Treatment

Primarily treated with penicillin G benzathine, which eradicates *Treponema pallidum*. Alternative antibiotics include doxycycline for penicillin-allergic patients. Early treatment prevents serious complications.

826. Chemotherapy of Malignancy

Use of cytotoxic drugs to destroy cancer cells by interfering with cell division or DNA replication. Includes alkylating agents, antimetabolites, mitotic inhibitors, and hormonal agents. Treatment may be combined with surgery or radiation.

827. Alkylating Agents

Drugs like cyclophosphamide that form covalent bonds with DNA, causing crosslinking and strand breaks. They are nonspecific and effective in many cancers but cause bone marrow suppression.

828. Antimetabolites

Cancer drugs resembling normal metabolites that inhibit DNA and RNA synthesis. Examples: Methotrexate (folic acid antagonist), 5-fluorouracil. Used in leukemias and solid tumors.

829. Immunostimulants

Agents that enhance the immune response to fight infections or malignancies. Include interferons, interleukins, and vaccines. Used to boost host defense mechanisms.

830. Interferons

Proteins produced naturally by host cells that have antiviral, antiproliferative, and immunomodulatory effects. Used in hepatitis, multiple sclerosis, and certain cancers.

831. Immunosuppressants

Drugs that inhibit immune responses to prevent transplant rejection or treat autoimmune diseases. Classes include corticosteroids, calcineurin inhibitors (cyclosporine), and mTOR inhibitors.

832. Corticosteroids as Immunosuppressants

Steroid hormones that reduce inflammation and suppress immune cell function. Used in autoimmune diseases, allergies, and transplant patients to prevent rejection.

833. Monoclonal Antibodies (mAbs)

Highly specific antibodies produced from a single clone of B cells. Used to target specific antigens in cancer, autoimmune diseases, and infections. Examples: Rituximab, trastuzumab.

834. Targeted Therapy

Drugs designed to target specific molecular pathways in diseases, such as tyrosine kinase inhibitors or monoclonal antibodies, minimizing damage to normal cells.

835. Biosimilars

Biological products highly similar to an approved original ("reference") biologic drug, with no meaningful clinical differences. They provide more affordable alternatives for therapies like monoclonal antibodies.

836. Protein Drugs

Therapeutic agents composed of proteins, such as hormones, enzymes, or antibodies, used to replace deficient proteins or modulate physiological functions.

837. Calcineurin Inhibitors

Immunosuppressants like cyclosporine and tacrolimus that inhibit T-cell activation by blocking calcineurin, preventing organ transplant rejection.

838. mTOR Inhibitors

Drugs that inhibit the mammalian target of rapamycin pathway, suppressing T-cell proliferation. Used in transplant immunosuppression and some cancers.

839. Combination Chemotherapy

Using multiple drugs with different mechanisms to enhance efficacy, reduce resistance, and minimize toxicity in cancer and infectious diseases.

840. Prophylactic Antibiotics in UTIs

Low-dose antibiotics administered to prevent recurrent urinary tract infections, often used in patients with anatomical abnormalities or chronic infections.

841. HIV Chemotherapy

Use of antiretroviral therapy combining reverse transcriptase inhibitors, protease inhibitors, and integrase inhibitors to suppress viral replication and improve immune function.

842. Toxicology

The scientific study of harmful effects of chemicals, drugs, or physical agents on living organisms. It assesses the nature, mechanisms, detection, and treatment of toxic substances.

843. Acute Toxicity

Adverse effects occurring within a short period after a single exposure to a toxic agent. Symptoms may appear immediately or within 24 hours and can be reversible or fatal.

844. Subacute Toxicity

Toxic effects resulting from repeated exposure over a period, typically up to 28 days. Used in studies to evaluate organ-specific damage and establish safe dosage limits.

845. Chronic Toxicity

Long-term adverse effects caused by prolonged exposure to toxic substances, often at low doses. It may cause cancer, organ damage, or reproductive effects.

846. Genotoxicity

The property of chemical agents that damages genetic information within a cell, causing mutations that can lead to cancer or hereditary defects.

847. Carcinogenicity

The ability of a substance to cause cancer by inducing cellular mutations or promoting tumor growth through genetic or epigenetic mechanisms.

848. Teratogenicity

The capability of a drug or chemical to cause developmental abnormalities or birth defects in a developing fetus when exposed during pregnancy.

849. Mutagenicity

The potential of a chemical agent to cause permanent genetic mutations in DNA, which may lead to cancer or hereditary diseases.

850. Poisoning Treatment Principles

Includes immediate removal from exposure, supportive care, use of antidotes, decontamination techniques like gastric lavage, and symptomatic management.

851. Barbiturate Poisoning

Overdose of barbiturates causing CNS depression, respiratory failure, and coma. Management includes supportive respiratory care and activated charcoal.

852. Morphine Poisoning

Excess morphine leads to respiratory depression, pinpoint pupils, and unconsciousness. Treatment includes naloxone administration and respiratory support.

853. Organophosphorus Poisoning

Toxicity from pesticides inhibiting acetylcholinesterase, leading to cholinergic crisis with muscle twitching, respiratory distress. Treated with atropine and pralidoxime.

854. Lead Poisoning

Chronic exposure causes anemia, neurological deficits, and kidney damage. Chelating agents like EDTA are used for treatment.

855. Mercury Poisoning

Causes neurological symptoms, tremors, and kidney dysfunction. Treatment includes chelation therapy with agents like dimercaprol.

856. Arsenic Poisoning

Exposure leads to gastrointestinal distress, cardiovascular collapse, and skin changes. Chelation with dimercaprol and supportive care are essential.

857. Chronopharmacology

Study of how biological rhythms affect drug actions and metabolism. It aims to optimize drug therapy timing for maximum efficacy and minimal toxicity.

858. Biological Rhythms

Endogenous cycles like circadian rhythms (~24 hours), ultradian, and infradian rhythms that regulate physiological processes.

859. Biological Clock

Internal timing system, mainly the suprachiasmatic nucleus in the brain, which synchronizes bodily functions with environmental cues like light.

860. Chronotherapy

The administration of drugs according to biological rhythms to improve therapeutic outcomes and reduce side effects.

861. Circadian Rhythm

A 24-hour biological cycle influencing sleep, hormone release, metabolism, and drug response, essential for timing drug delivery.

BP 603 T. HERBAL DRUG TECHNOLOGY(Theory)

862. Herb

A herb is any plant or plant part valued for its medicinal, culinary, or aromatic properties. In pharmacognosy, it specifically refers to a plant used for its therapeutic benefits either as fresh or dried material.

863. Herbal Medicine

Medicinal products made from plants or plant extracts used to prevent or treat diseases, often based on traditional knowledge, containing multiple bioactive compounds.

864. Herbal Medicinal Product

A formulation containing herbal substances or preparations used for medicinal purposes, including tinctures, extracts, powders, or tablets derived from plants.

865. Herbal Drug Preparation

The process of converting raw herbal materials into usable forms such as decoctions, infusions, extracts, and powders, ensuring stability and efficacy.

866. Source of Herbs

Herbs are sourced from various plant parts including leaves, roots, bark, flowers, seeds, and fruits, cultivated or collected from wild habitats.

867. Selection of Herbal Materials

Choosing high-quality, authentic plant material based on botanical characteristics, origin, and harvesting time to ensure maximum therapeutic value.

868. Identification and Authentication

Techniques like macroscopic, microscopic examination and chemical profiling used to confirm the botanical identity and purity of herbal raw materials.

869. Processing of Herbal Raw Material

Includes cleaning, drying, grinding, extraction, and preservation methods to maintain active constituents and prevent microbial contamination.

870. Biodynamic Agriculture

An ecological farming system that treats farms as unified organisms, emphasizing soil fertility, biodiversity, and the use of natural preparations in growing medicinal plants.

871. Good Agricultural Practices (GAP)

Standards and guidelines ensuring the quality and safety of medicinal plants through proper cultivation, harvesting, and post-harvest handling.

872. Organic Farming

Cultivation of medicinal plants without synthetic fertilizers, pesticides, or genetically modified organisms, promoting environmental sustainability and product purity.

873. Pest Management in Medicinal Plants

Integrated strategies to control pests affecting medicinal plants using cultural, biological, and chemical methods with minimal environmental impact.

874. Biopesticides

Natural pest control agents derived from microorganisms, plants, or minerals that are environmentally safe alternatives to synthetic pesticides.

875. Bioinsecticides

Biological agents such as bacteria, fungi, or viruses used specifically to target and control insect pests in agriculture.

876. Ayurveda

An ancient Indian system of medicine based on balancing the three doshas (Vata, Pitta, Kapha) using herbs, diet, and lifestyle for health and disease prevention.

877. Siddha Medicine

A traditional South Indian medicinal system focusing on herbal remedies, minerals, and yoga, emphasizing the balance of the five elements in the body.

878. Unani Medicine

A Greco-Arabic traditional system of medicine using herbal, mineral, and animal products to restore humoral balance and treat diseases.

879. Homeopathy

A system of alternative medicine based on “like cures like” principle, using highly diluted substances to stimulate the body’s self-healing.

880. Standardization of Herbal Preparations

Processes ensuring herbal products contain consistent amounts of active constituents, using techniques like chromatography and spectrophotometry.

881. Authentication Methods

Use of DNA barcoding, microscopy, and chemical markers to verify the genuineness and quality of herbal raw materials to prevent adulteration.

882. Nutraceuticals

Products derived from food sources that provide extra health benefits beyond basic nutrition. They can prevent or treat diseases, improve health, and delay aging, including vitamins, minerals, herbal extracts, and functional foods.

883. Market Growth of Nutraceuticals

The nutraceutical market is rapidly expanding globally due to increasing consumer interest in health and wellness, aging populations, and rising chronic diseases.

884. Types of Nutraceuticals

Includes dietary supplements, functional foods, probiotics, prebiotics, fortified foods, and herbal products designed to support health.

885. Health Benefits in Diabetes

Certain nutraceuticals help regulate blood sugar, improve insulin sensitivity, and reduce diabetic complications, such as fenugreek and bitter melon.

886. Cardiovascular Disease (CVS) Nutraceuticals

Compounds like omega-3 fatty acids, garlic, and ginseng improve lipid profiles, reduce blood pressure, and prevent atherosclerosis.

887. Nutraceuticals in Cancer

Some nutraceuticals possess antioxidant and anti-inflammatory properties, helping reduce cancer risk or support treatment, including green tea and curcumin.

888. Irritable Bowel Syndrome (IBS) and Nutraceuticals

Probiotics and fiber-rich nutraceuticals help regulate gut flora, improve bowel movements, and alleviate IBS symptoms.

889. Gastrointestinal Disease Nutraceuticals

Herbs like ginger and aloe vera soothe inflammation, reduce nausea, and promote digestion in various GI disorders.

890. Alfalfa

A nutrient-rich herb high in vitamins, minerals, and antioxidants, traditionally used to support digestion and reduce cholesterol.

891. Chicory

Contains inulin, a prebiotic fiber that promotes gut health and aids in managing diabetes and digestive disorders.

892. Ginger

Widely used for its anti-inflammatory and anti-nausea properties, ginger helps digestion and reduces muscle pain.

893. Fenugreek

Contains soluble fiber that lowers blood glucose and cholesterol, beneficial in diabetes and heart disease management.

894. Garlic

Known for cardiovascular benefits, including blood pressure reduction and cholesterol lowering, plus antimicrobial effects.

895. Honey

A natural sweetener with antioxidant, antimicrobial, and wound healing properties.

896. Amla (Indian Gooseberry)

Rich in vitamin C and antioxidants, amla supports immune function and reduces oxidative stress.

897. Ginseng

An adaptogen that enhances energy, cognitive function, and immune response, also used for stress management.

898. Ashwagandha

An Ayurvedic herb with anti-stress, anti-inflammatory, and neuroprotective effects, improving mental health.

899. Spirulina

A blue-green algae rich in proteins, vitamins, and antioxidants, promoting overall health and immune function.

900. Herbal-Drug Interactions

When herbal products alter the pharmacokinetics or pharmacodynamics of drugs, leading to enhanced toxicity or reduced efficacy.

901. Herbal-Food Interactions

Certain foods can affect the absorption or metabolism of herbal compounds, influencing therapeutic outcomes or side effects.

902. Herbal Cosmetics

Cosmetic products made from natural plant-based ingredients, free from synthetic chemicals. They are used for skin, hair, and oral care with benefits like moisturizing, anti-aging, and soothing effects.

903. Fixed Oils

Vegetable oils extracted from seeds or fruits, used in cosmetics for their emollient and moisturizing properties, e.g., coconut oil and almond oil.

904. Waxes

Natural substances like beeswax used as protective agents in cosmetics to provide texture, stability, and barrier properties.

905. Gums

Natural polysaccharides such as acacia gum used as thickening agents, stabilizers, and emulsifiers in herbal formulations.

906. Colors in Herbal Cosmetics

Natural colorants derived from plants or minerals to impart aesthetic appeal without toxic effects.

907. Perfumes

Fragrances obtained from essential oils or aromatic herbs used to provide pleasant scent in cosmetic products.

908. Protective Agents

Ingredients like aloe vera and chamomile that protect skin from environmental damage and irritation.

909. Bleaching Agents

Natural substances like licorice extract used in herbal cosmetics to lighten skin pigmentation.

910. Antioxidants

Compounds such as vitamin E and green tea polyphenols that prevent oxidative damage to skin cells and preserve product stability.

911. Herbal Excipients

Natural substances from plants used as binders, fillers, sweeteners, disintegrants, and flavors in herbal drug formulations.

912. Colorants as Excipients

Plant-derived pigments used to color herbal medicines and cosmetics naturally.

913. Sweeteners in Herbal Formulations

Natural sugars like honey or stevia used to improve taste in herbal syrups and mixtures.

914. Binders

Substances like acacia gum that hold powder particles together in tablets ensuring mechanical strength.

915. Diluents

Inert substances such as starch that add bulk to herbal formulations making them easier to handle.

916. Viscosity Builders

Natural gums or cellulose derivatives that increase the thickness and consistency of liquid herbal products.

917. Disintegrants

Plant-based materials that help tablets break down rapidly in the digestive tract for better absorption.

918. Flavors & Perfumes

Natural extracts used to mask unpleasant tastes or odors in herbal formulations, enhancing patient compliance.

919. Conventional Herbal Formulations

Traditional dosage forms such as syrups, mixtures, and tablets prepared using herbal extracts for therapeutic use.

920. Phytosomes

Advanced herbal delivery systems where herbal extracts are bound to phospholipids to enhance bioavailability and absorption.

921. Novel Herbal Dosage Forms

Innovative formulations including nanoparticles, liposomes, and phytosomes designed to improve stability, efficacy, and targeted delivery of herbal actives.

922. Evaluation of Herbal Drugs

The systematic study of herbal products' safety, efficacy, and quality using pharmacological, toxicological, and chemical analysis to ensure therapeutic consistency.

923. WHO Guidelines

Standards developed by the World Health Organization to harmonize the quality assessment, safety evaluation, and efficacy of herbal medicines worldwide.

924. ICH Guidelines

International Council for Harmonisation guidelines providing regulatory standards for pharmaceutical quality, safety, and efficacy, including herbal drug evaluation.

925. Stability Testing

A set of procedures to determine the shelf life and quality retention of herbal drugs under various environmental conditions like temperature and humidity.

926. Patent

A legal right granted to an inventor to exclude others from making, using, or selling an invention for a specific period, encouraging innovation.

927. Intellectual Property Rights (IPR)

Legal rights protecting creations of the mind, including patents, copyrights, trademarks, and trade secrets relevant to natural product innovations.

928. Farmers' Rights

Rights recognizing farmers' contributions in conserving, improving, and making available plant genetic resources, ensuring their benefit-sharing.

929. Breeder's Rights

Legal protection granted to plant breeders for the new varieties they develop, preventing unauthorized propagation or sale.

930. Bioprospecting

The exploration of biodiversity for commercially valuable genetic and biochemical resources for pharmaceuticals, cosmetics, and agriculture.

931. Biopiracy

Unauthorized and unethical exploitation of indigenous biological resources or traditional knowledge by commercial entities without proper compensation.

932. Traditional Knowledge Patenting

Legal protection issues related to patenting indigenous knowledge to prevent misappropriation and ensure benefit-sharing with native communities.

933. Curcuma Case Study

Examining patent disputes and benefit-sharing related to turmeric (Curcuma longa), a traditional medicinal plant with anti-inflammatory properties.

934. Neem Case Study

Analysis of biopiracy claims concerning neem tree patents and the efforts to protect indigenous knowledge through legal frameworks.

935. ASU DTAB (Ayurveda, Siddha, Unani Drugs Technical Advisory Board)

A regulatory body in India advising on standards, quality, and safety of ASU drugs, ensuring scientific development and regulation.

936. ASU DCC (Ayurveda, Siddha, Unani Drugs Consultative Committee)

A committee coordinating regulatory matters, formulation standards, and manufacturing practices for traditional Indian medicines.

937. Schedule Z of Drugs & Cosmetics Act

Specific regulations governing the manufacture and quality standards for Ayurveda, Siddha, and Unani drugs in India.

938. Regulation of ASU Drugs

Legal provisions ensuring the safety, efficacy, and quality control of traditional herbal medicines manufactured and marketed in India.

939. Quality Control of Herbal Drugs

Processes involving physical, chemical, microbiological, and chromatographic methods to assure herbal product purity and potency.

940. Herbal Drug Shelf Life

The period during which a herbal product retains its therapeutic properties and remains safe to use under specified storage conditions.

941. Regulatory Challenges in Herbal Medicine

Issues like standardization, quality control, intellectual property, and safety monitoring that affect the global acceptance and commercialization of herbal products.

942. Herbal Drugs Industry

Sector involved in the cultivation, processing, and manufacturing of medicinal plant products used as herbal medicines, cosmetics, and supplements. It has significant growth potential due to rising global demand for natural health products.

943. Scope of Herbal Industry

Expanding rapidly worldwide driven by consumer preference for natural therapies, increasing awareness of plant-based medicines, and integration with modern healthcare.

944. Future Prospects of Herbal Industry

Includes advancements in biotechnology, standardization, global market expansion, and incorporation of novel delivery systems enhancing efficacy and safety.

945. Medicinal Plants

Plants containing active compounds used for therapeutic purposes, forming the raw material base for the herbal industry.

946. Aromatic Plants

Plants producing essential oils used in perfumery, flavoring, and therapeutic applications, important in pharmaceutical and cosmetic industries.

947. Schedule T

A chapter under the Drugs & Cosmetics Act specifying Good Manufacturing Practices (GMP) guidelines for Indian systems of medicine including Ayurveda, Siddha, and Unani.

948. Good Manufacturing Practice (GMP)

A system ensuring herbal medicines are consistently produced and controlled according to quality standards to safeguard consumer safety.

949. Components of GMP (Schedule T)

Include personnel qualification, hygiene, premises, equipment, raw materials, documentation, and quality control essential for compliance.

950. Objectives of GMP

To ensure product quality, safety, efficacy, and reproducibility by controlling all stages of manufacturing.

951. Infrastructural Requirements

Adequate facilities such as clean production areas, proper ventilation, water supply, and storage to maintain quality during manufacturing.

952. Working Space

Sufficient area designed to avoid contamination and cross-contamination, ensuring smooth workflow in herbal product manufacturing.

953. Storage Area

Designated places for raw materials, intermediates, and finished products under controlled conditions to preserve stability.

954. Machinery and Equipment

Specialized tools and devices used for processing, extraction, drying, and packaging of herbal products adhering to GMP standards.

955. Standard Operating Procedures (SOPs)

Written instructions detailing each step of manufacturing, quality control, and documentation processes for consistency.

956. Health and Hygiene

Practices including cleanliness, sanitation, and employee training to prevent contamination and maintain a safe manufacturing environment.

957. Documentation and Records

Systematic recording of batch production, quality control tests, equipment maintenance, and personnel training for traceability.

958. Quality Assurance in Herbal Industry

Ensuring herbal products meet specified standards throughout production, minimizing risks to consumers.

959. Challenges in Herbal Manufacturing

Include variability in raw materials, lack of standardization, regulatory hurdles, and quality control complexities.

960. Role of Biotechnology

Advances like tissue culture and genetic engineering enhancing consistent supply and quality of medicinal plants in the herbal industry.

BP604 T. BIOPHARMACEUTICS AND PHARMACOKINETICS (Theory)

961. Biopharmaceutics

The study of how the physical and chemical properties of drugs, dosage forms, and the route of administration affect the rate and extent of drug absorption, distribution, metabolism, and excretion. It helps optimize therapeutic efficacy and safety.

962. Drug Absorption

Process by which a drug moves from its site of administration into the bloodstream. It determines the onset, intensity, and duration of drug action.

963. Gastrointestinal Tract (GIT) Absorption

Drug absorption mainly occurs in the small intestine due to its large surface area. Factors such as pH, enzymatic activity, and motility affect this process.

964. Mechanisms of Drug Absorption

Include passive diffusion, facilitated diffusion, active transport, and endocytosis. Passive diffusion is the most common, driven by concentration gradients.

965. Factors Influencing Drug Absorption Through GIT

Include drug solubility, pH, gastric emptying time, presence of food, intestinal flora, and interactions with other substances.

966. Non-Peroral Extravascular Routes

Routes like intramuscular, subcutaneous, and transdermal where drugs bypass the digestive system but require absorption into systemic circulation.

967. Drug Distribution

The reversible transfer of drugs from the bloodstream to tissues and organs. It influences drug concentration at the site of action and toxicity.

968. Tissue Permeability

Ability of drugs to cross biological membranes and penetrate tissues depends on molecular size, lipophilicity, and ionization.

969. Plasma Protein Binding

Drugs bind reversibly to plasma proteins like albumin and alpha-1 acid glycoprotein, affecting free drug levels available for activity.

970. Tissue Protein Binding

Binding of drugs to proteins within tissues can create reservoirs that influence drug duration and distribution.

971. Apparent Volume of Distribution (Vd)

A theoretical volume indicating the extent of drug distribution in body tissues relative to plasma concentration; used to estimate dosing.

972. Factors Affecting Protein-Drug Binding

Include drug affinity, plasma protein concentration, competition with other drugs, disease states, and genetic factors.

973. Kinetics of Protein Binding

The rate at which drugs bind and unbind plasma proteins affects their free concentration and pharmacological effect.

974. Clinical Significance of Protein Binding

Only the free (unbound) drug is pharmacologically active; changes in binding affect drug efficacy and toxicity.

975. Drug Bioavailability

The proportion of administered drug reaching systemic circulation in an active form, influenced by absorption and first-pass metabolism.

976. First-Pass Effect

Metabolism of drugs in the liver after oral absorption reducing the amount reaching systemic circulation.

977. Lipid Solubility

Highly lipophilic drugs cross cell membranes more easily, influencing absorption and distribution.

978. Ionization and pKa

Degree of ionization affects drug solubility and permeability; drugs absorb best in non-ionized form.

979. Drug Transporters

Proteins that facilitate or inhibit drug absorption and distribution by active transport mechanisms.

980. Pharmacokinetics vs. Biopharmaceutics

Pharmacokinetics studies drug movement in the body over time, while biopharmaceutics focuses on the relationship between physical properties and drug effects.

981. Drug Metabolism

The biochemical modification of drugs by living organisms, mainly in the liver, transforming lipophilic drugs into more hydrophilic metabolites for easier elimination.

982. Metabolic Pathways

Include Phase I (oxidation, reduction, hydrolysis) and Phase II (conjugation) reactions that alter drug molecules to facilitate excretion.

983. Renal Excretion

The elimination of drugs and metabolites through the kidneys via glomerular filtration, tubular secretion, and reabsorption.

984. Factors Affecting Renal Excretion

Include renal blood flow, protein binding, urine pH, and drug molecular size influencing clearance rates.

985. Renal Clearance

The volume of plasma completely cleared of a drug by the kidneys per unit time, essential for dosing adjustments.

986. Non-Renal Routes of Excretion

Drug elimination through bile, lungs, sweat, saliva, and breast milk.

987. Bioavailability

The fraction of an administered dose reaching systemic circulation unchanged, crucial for drug efficacy.

988. Absolute Bioavailability

Comparison of bioavailability of a drug via non-intravenous route to intravenous administration.

989. Relative Bioavailability

Comparison of bioavailability between two different formulations or routes.

990. Measurement of Bioavailability

Typically assessed using plasma drug concentration-time profiles and pharmacokinetic parameters like AUC (Area Under Curve).

991. In Vitro Drug Dissolution Models

Laboratory techniques to simulate drug dissolution in the gastrointestinal tract, predicting in vivo performance.

992. In Vitro-In Vivo Correlation (IVIVC)

A predictive relationship between in vitro dissolution data and in vivo drug absorption, used in formulation development.

993. Bioequivalence Studies

Comparative studies between generic and brand drugs to ensure similar bioavailability and therapeutic effects.

994. Enhancing Dissolution Rates

Techniques include particle size reduction, solid dispersions, salt formation, and use of surfactants.

995. Poorly Soluble Drugs

Drugs with low aqueous solubility leading to limited bioavailability, requiring formulation strategies to improve absorption.

996. First-Pass Metabolism

Metabolic degradation of a drug before it reaches systemic circulation, reducing bioavailability.

997. Clearance

The volume of plasma cleared of a drug per unit time, a key pharmacokinetic parameter.

998. Excretion Half-Life

The time taken for the drug concentration to reduce to half through elimination processes.

999. Drug Transporters in Excretion

Proteins that actively secrete or reabsorb drugs in renal tubules, influencing elimination.

1000. Pharmacokinetic Parameters

Variables like Cmax, Tmax, and AUC used to describe the absorption, distribution, metabolism, and excretion of drugs.

1001. Pharmacokinetics

The study of drug absorption, distribution, metabolism, and elimination over time, focusing on quantifying drug concentration changes within the body to optimize dosing and efficacy.

1002. Compartment Models

Mathematical representations dividing the body into compartments (e.g., one or two compartments) to simplify drug distribution and elimination kinetics for analysis.

1003. Non-Compartmental Models

Pharmacokinetic analysis methods that do not assume specific compartments, using statistical moment theory for parameter estimation.

1004. Physiological Models

Models that use actual organ and tissue volumes and blood flows to simulate drug kinetics based on body physiology.

1005. One Compartment Open Model

Simplest model assuming the body acts as a single, uniform compartment where drug distribution is instantaneous after administration.

1006. Intravenous (IV) Bolus Injection

A rapid injection of drug directly into the bloodstream, resulting in immediate systemic circulation and rapid onset.

1007. Intravenous Infusion

Slow, continuous administration of drug into the bloodstream over a set period, allowing controlled plasma concentrations.

1008. Extravascular Administration

Drug administration routes other than intravenous, such as oral, intramuscular, or subcutaneous, requiring absorption before systemic circulation.

1009. Elimination Rate Constant (KE)

The proportionality constant representing the rate at which a drug is removed from the body per unit time.

1010. Half-Life (t1/2)

The time required for the plasma drug concentration to decrease by half, reflecting elimination speed.

1011. Volume of Distribution (Vd)

A theoretical volume that relates the amount of drug in the body to the plasma concentration, indicating drug distribution extent.

1012. Area Under the Curve (AUC)

Integral of the plasma drug concentration vs. time graph, representing total drug exposure over time.

1013. Absorption Rate Constant (Ka)

Rate at which a drug moves from the administration site into systemic circulation.

1014. Total Clearance (Clt)

Volume of plasma cleared of the drug per unit time through all elimination routes.

1015. Renal Clearance (CLR)

Volume of plasma cleared of the drug per unit time specifically by the kidneys.

1016. Methods of Elimination

Drug removal by metabolism, renal excretion, biliary excretion, or other routes.

1017. Significance of KE

Determines how fast the drug concentration declines, impacting dosing intervals.

1018. Application of Half-Life

Helps design dosing schedules and predict duration of drug action.

1019. Clinical Use of Vd

Used to estimate loading doses and understand drug distribution patterns.

1020. Pharmacokinetic Parameters Application

Aid in drug formulation, therapeutic drug monitoring, and individualizing patient therapy.

1021. Multicompartment Models

Pharmacokinetic models that divide the body into two or more compartments (central and peripheral), reflecting complex drug distribution and elimination patterns better than one-compartment models.

1022. Two-Compartment Open Model

Divides the body into central (blood and highly perfused organs) and peripheral (less perfused tissues) compartments, with drug moving between them and elimination occurring from the central compartment.

1023. IV Bolus in Two-Compartment Model

Rapid drug injection into the bloodstream followed by a rapid distribution phase into peripheral tissues and a slower elimination phase.

1024. Kinetics of Multiple Dosing

Study of drug accumulation, fluctuations, and steady-state achievement when repeated doses are administered at fixed intervals.

1025. Steady-State Drug Levels

The point at which the rate of drug administration equals the rate of elimination, resulting in a consistent plasma drug concentration.

1026. Loading Dose

An initial higher dose given to rapidly achieve therapeutic drug levels in plasma, especially important for drugs with long half-lives.

1027. Maintenance Dose

The dose administered regularly after the loading dose to maintain steady-state plasma concentrations within the therapeutic window.

1028. Calculation of Loading Dose

Calculated using the formula: Loading Dose = Desired Plasma Concentration × Volume of Distribution ÷ Bioavailability.

1029. Calculation of Maintenance Dose

Determined by Clearance and desired steady-state concentration: Maintenance Dose = Clearance × Desired Concentration × Dosing Interval ÷ Bioavailability.

1030. Clinical Significance of Loading Dose

Allows faster attainment of therapeutic effects, reducing treatment initiation delays.

1031. Clinical Importance of Maintenance Dose

Ensures consistent therapeutic drug levels, avoiding subtherapeutic or toxic concentrations.

1032. Drug Accumulation

Increase in drug plasma levels with repeated dosing until steady-state is reached, depending on dosing frequency and half-life.

1033. Dosing Interval

Time between doses; critical for maintaining therapeutic levels without toxicity.

1034. Therapeutic Window

Range of drug concentrations providing efficacy without causing toxicity.

1035. Fluctuation in Drug Levels

Variations in plasma concentration between doses, minimized by appropriate dosing schedules.

1036. Bioavailability (F)

Fraction of administered drug reaching systemic circulation; important in dose calculations.

1037. Half-Life and Steady-State

Steady-state is generally achieved after about 4-5 half-lives of the drug.

1038. Pharmacokinetic Parameters in Multiple Dosing

KE, Vd, clearance, and bioavailability all influence dose regimen design.

1039. Implications in Chronic Therapy

Multiple dosing principles are essential for long-term treatment, ensuring efficacy and safety.

1040. Monitoring Drug Levels

Therapeutic drug monitoring guides dose adjustments to maintain desired steady-state levels.

1041. Nonlinear Pharmacokinetics

Occurs when the relationship between drug dose and plasma concentration is not proportional. Drug absorption, distribution, metabolism, or elimination processes become saturated at therapeutic concentrations, causing deviations from linear kinetics.

1042. Introduction to Nonlinearity

Nonlinear pharmacokinetics arises due to saturation of enzymes, transporters, or plasma proteins affecting drug handling, impacting dose adjustments and therapeutic monitoring.

1043. Factors Causing Non-Linearity

Include saturation of metabolic enzymes (e.g., CYP450), saturable protein binding, limited renal tubular secretion, and carrier-mediated transport.

1044. Michaelis-Menten Kinetics

A mathematical model describing enzyme-mediated reactions that follow saturation kinetics, used to analyze nonlinear drug metabolism.

1045. Parameters in Michaelis-Menten Model

Includes Vmax (maximum metabolism rate) and Km (drug concentration at half Vmax), crucial for characterizing nonlinear elimination.

1046. Vmax

Represents the enzyme's maximal metabolic capacity when all active sites are saturated by the drug.

1047. Km (Michaelis Constant)

The substrate concentration at which the metabolic rate is half of Vmax, indicating enzyme affinity.

1048. Saturation of Enzymes

At high drug concentrations, enzymes metabolizing the drug become fully occupied, causing disproportionate increases in plasma levels.

1049. Clinical Example: Phenytoin

An anticonvulsant exhibiting nonlinear kinetics where small dose increases can lead to large plasma concentration spikes due to enzyme saturation.

1050. Implications of Nonlinearity

Dosing adjustments require caution; therapeutic drug monitoring is essential to avoid toxicity or subtherapeutic levels.

1051. Nonlinear Absorption

Occurs when drug transporters or enzymes involved in absorption become saturated, affecting bioavailability.

1052. Nonlinear Protein Binding

At high concentrations, plasma protein binding sites saturate, increasing free drug concentration disproportionately.

1053. Nonlinear Renal Excretion

Occurs when active tubular secretion reaches saturation, altering clearance.

1054. Michaelis-Menten Equation

$v = (V_{max} \times [S]) / (K_m + [S])$ where v is reaction velocity and [S] is substrate concentration.

1055. Estimation of Parameters

Nonlinear regression or Lineweaver-Burk plots are used to estimate Vmax and Km from experimental data.

1056. Dose-Dependent Clearance

Clearance changes with dose due to saturable metabolism, differing from constant clearance in linear kinetics.

1057. Therapeutic Drug Monitoring in Nonlinear Drugs

Critical for drugs like theophylline and carbamazepine to maintain safe plasma concentrations.

1058. Nonlinear Pharmacokinetic Models

More complex than linear models, requiring specialized software and expertise.

1059. Saturation Kinetics vs. Capacity-Limited Kinetics

Both terms describe processes where system capacity limits drug metabolism or transport.

1060. Importance in Drug Development

Understanding nonlinear kinetics guides dosing regimen design and risk assessment during clinical trials.

BP605 T. PHARMACEUTICAL BIOTECHNOLOGY (Theory)

1061. Biotechnology in Pharmaceutical Sciences

Biotechnology applies biological systems and organisms to develop drugs, vaccines, and diagnostic tools. It involves genetic engineering, recombinant DNA technology, and cell culture to produce biopharmaceuticals, improving therapeutic efficacy and safety. This field revolutionizes drug discovery, personalized medicine, and production of complex proteins like insulin and monoclonal antibodies.

1062. Enzyme Biotechnology

This branch focuses on using enzymes as biocatalysts for pharmaceutical synthesis and industrial processes. It includes enzyme isolation, purification, immobilization, and optimization to improve stability and reusability in drug manufacturing.

1063. Enzyme Immobilization Methods

Techniques like adsorption, covalent binding, entrapment, and encapsulation fix enzymes onto supports, enhancing stability, allowing repeated use, and simplifying product separation in bioprocesses.

1064. Applications of Immobilized Enzymes

Used in drug synthesis, biosensors, bioreactors, and waste treatment, immobilized enzymes increase efficiency, selectivity, and environmental sustainability.

1065. Biosensors

Analytical devices combining a biological recognition element (enzyme, antibody) with a transducer to convert biochemical signals into measurable electrical outputs, useful for drug analysis and diagnostics.

1066. Biosensors in Pharmaceuticals

Used for monitoring drug levels, detecting contaminants, and quality control, biosensors provide rapid, sensitive, and on-site testing.

1067. Protein Engineering

The design and modification of proteins to enhance stability, activity, or specificity for pharmaceutical applications using techniques like site-directed mutagenesis and recombinant DNA technology.

1068. Microbial Use in Industry

Microorganisms are exploited for producing antibiotics, enzymes, vitamins, and vaccines. They offer cost-effective, scalable, and sustainable production platforms.

1069. Amylase Production

An enzyme breaking down starch into sugars, produced by microbes like Bacillus species, widely used in pharmaceuticals for digestive aids and drug formulations.

1070. Catalase Production

Catalase decomposes hydrogen peroxide to water and oxygen, protecting cells from oxidative damage; industrially produced via microbial fermentation for biomedical and food applications.

1071. Peroxidase Production

Peroxidase catalyzes oxidation reactions, employed in biosensors and immunoassays, produced through microbial sources for pharmaceutical use.

1072. Lipase Production

Lipase hydrolyzes fats and oils, aiding drug delivery systems and biodiesel production, produced using fungal or bacterial fermentation.

1073. Protease Production

Proteases break down proteins and are utilized in wound care, diagnostics, and drug formulation; microbial fermentation is a common production method.

1074. Penicillinase Production

An enzyme degrading penicillin, produced by bacteria, important for studying antibiotic resistance and drug design.

1075. Genetic Engineering Principles

Manipulation of an organism's DNA using recombinant DNA techniques to insert, delete, or modify genes, enabling the production of therapeutic proteins and vaccines.

1076. Recombinant DNA Technology

Combines DNA from different organisms to create genetically modified products, revolutionizing drug development and production.

1077. Gene Cloning

Process of creating multiple copies of a gene of interest for research, therapeutic protein production, or genetic modification.

1078. Expression Vectors

DNA molecules used to introduce foreign genes into host cells for protein production, critical in biotechnology and pharmaceuticals.

1079. CRISPR Technology

A precise gene-editing tool allowing targeted modification of DNA sequences, with potential applications in treating genetic diseases.

1080. Bioreactors in Biotechnology

Vessels designed to cultivate microorganisms or cells under controlled conditions to produce enzymes, vaccines, or drugs at an industrial scale.

1081. Cloning Vectors

Cloning vectors are DNA molecules used to carry foreign genetic material into a host cell for replication. Common vectors include plasmids, bacteriophages, and cosmids. They contain essential elements like an origin of replication, selectable markers, and multiple cloning sites. Cloning vectors facilitate gene cloning, expression, and genetic manipulation.

1082. Restriction Endonucleases

Enzymes that cut DNA at specific nucleotide sequences called recognition sites. These molecular scissors produce either blunt or sticky ends, enabling precise DNA fragment manipulation. They are fundamental tools in genetic engineering for cutting and pasting DNA fragments.

1083. DNA Ligase

An enzyme that joins DNA fragments by catalyzing phosphodiester bond formation between adjacent nucleotides. It is critical in recombinant DNA technology to seal nicks after DNA fragments are inserted into vectors.

1084. Recombinant DNA Technology

A technique combining DNA molecules from different sources to create new genetic combinations. It involves cutting DNA with restriction enzymes, ligating fragments, and introducing recombinant molecules into host cells for replication or expression.

1085. Applications in Medicine

Genetic engineering aids in producing therapeutic proteins, gene therapy, and developing diagnostic tools. It enables mass production of hormones, vaccines, and interferons with high purity and efficacy.

1086. Interferon Production

Interferons are proteins with antiviral and immunomodulatory properties. Recombinant DNA technology allows their large-scale production by inserting interferon genes into bacterial or mammalian cells.

1087. Hepatitis B Vaccine

Produced by inserting the hepatitis B virus surface antigen gene into yeast or mammalian cells, leading to antigen expression. This recombinant vaccine is safe and effective in preventing hepatitis B infection.

1088. Insulin Production

Human insulin gene cloned into bacteria (e.g., E. coli) for recombinant insulin production. This recombinant insulin is identical to natural insulin, improving diabetes management and reducing immunogenicity.

1089. Polymerase Chain Reaction (PCR)

A technique to amplify specific DNA sequences exponentially through thermal cycling, using primers, DNA polymerase, nucleotides, and template DNA. PCR is essential for cloning, diagnosis, and genetic research.

1090. Vectors in Genetic Engineering

Serve as carriers to transfer foreign DNA into host cells, facilitating gene cloning, expression, or manipulation.

1091. Sticky Ends vs. Blunt Ends

Sticky ends have overhanging single-stranded DNA that facilitates complementary base pairing; blunt ends are straight cuts without overhangs, affecting cloning efficiency.

1092. Selectable Markers

Genes in cloning vectors that confer antibiotic resistance, enabling identification of cells that have incorporated recombinant DNA.

1093. Expression Vectors

Specialized vectors designed to ensure transcription and translation of cloned genes in host cells to produce proteins.

1094. Host Cells in Cloning

Cells like E. coli or yeast used to replicate and express recombinant DNA.

1095. Gene Therapy

Application of recombinant DNA technology to treat genetic disorders by inserting functional genes into patient cells.

1096. Molecular Cloning

Process of replicating specific DNA fragments by inserting them into vectors and host organisms.

1097. DNA Sequencing

Determining the nucleotide sequence of cloned DNA fragments for analysis and verification.

1098. Restriction Mapping

Using restriction enzymes to cut DNA at specific sites to create a map of restriction sites, aiding gene characterization.

1099. Southern Blotting

A technique to detect specific DNA sequences in a sample using hybridization with labeled probes.

1100. Gene Expression Analysis

Studying the transcription and translation of recombinant genes in host cells to assess protein production.

1101. Types of Immunity

Immunity is the body's defense against pathogens. It is broadly classified into humoral immunity, mediated by antibodies produced by B cells, and cellular immunity, driven by T cells that kill infected cells or help other immune cells.

1102. Humoral Immunity

Involves B lymphocytes producing antibodies targeting specific antigens. These antibodies neutralize pathogens or mark them for destruction, providing protection against extracellular microbes.

1103. Cellular Immunity

Mediated by T lymphocytes that identify and destroy infected or cancerous cells and regulate immune responses through cytokine secretion.

1104. Immunoglobulin Structure

Immunoglobulins (Ig) are Y-shaped glycoproteins with two heavy and two light chains. They have variable regions that bind antigens and constant regions that mediate immune functions.

1105. Major Histocompatibility Complex (MHC)

Proteins on cell surfaces presenting antigen peptides to T cells. Class I MHC presents to cytotoxic T cells; Class II MHC presents to helper T cells, crucial for adaptive immunity.

1106. Hypersensitivity Reactions

Exaggerated immune responses causing tissue damage. Types I-IV hypersensitivities include allergies, cytotoxic reactions, immune complex-mediated, and delayed-type hypersensitivity.

1107. Immune Stimulation

Use of vaccines or adjuvants to boost the immune response against pathogens or tumors by activating lymphocytes.

1108. Immune Suppression

Therapeutic or pathological reduction of immune activity, important in preventing transplant rejection and treating autoimmune diseases.

1109. Bacterial Vaccines

Prepared using killed or attenuated bacteria to stimulate protective immunity without causing disease.

1110. Toxoids

Inactivated bacterial toxins used as vaccines to induce immunity against toxin-mediated diseases like tetanus.

1111. Viral Vaccines

Contain attenuated or inactivated viruses to provoke immune protection against viral infections.

1112. Antitoxins

Antibodies produced in animals or humans against specific toxins, used to neutralize toxin effects in treatments.

1113. Serum and Immune Blood Derivatives

Includes immunoglobulin preparations and plasma components used therapeutically for passive immunity.

1114. Storage of Vaccines

Requires strict cold chain maintenance to preserve potency, preventing degradation by heat or light.

1115. Vaccine Stability

Depends on formulation and storage; unstable vaccines lose efficacy and safety.

1116. Hybridoma Technology

Technique for producing monoclonal antibodies by fusing antibody-producing B cells with myeloma cells, yielding immortal antibody-secreting cells.

1117. Monoclonal Antibody Production

Hybridomas produce identical antibodies for diagnostics, therapeutics, and research with high specificity.

1118. Purification of Monoclonal Antibodies

Involves protein A/G affinity chromatography and other methods to isolate pure antibodies.

1119. Applications of Hybridoma Technology

Used in cancer therapy, infectious disease diagnosis, and targeted drug delivery.

1120. Blood Products and Plasma Substitutes

Include whole blood, plasma, clotting factors, and synthetic volume expanders used in transfusion and shock management.

1121. ELISA (Enzyme-Linked Immunosorbent Assay)

ELISA is a sensitive immunological assay used to detect and quantify antigens or antibodies. It involves immobilizing an antigen on a solid surface, followed by binding of specific antibodies linked to enzymes. Upon addition of a substrate, a color change indicates presence and amount of target molecules. ELISA is widely used in diagnostics, vaccine development, and research.

1122. Western Blotting

Western blot is a protein detection technique where proteins are separated by gel electrophoresis, transferred onto a membrane, and probed with specific antibodies. It confirms protein expression and size, commonly used in disease diagnostics and research.

1123. Southern Blotting

A DNA detection technique where DNA fragments separated by electrophoresis are transferred to membranes and hybridized with labeled probes to identify specific sequences. Used in genetic research and diagnostics.

1124. Genetic Organization of Eukaryotes

Eukaryotic DNA is linear, organized into chromosomes within a nucleus. Genes contain introns and exons, regulated by complex promoters and enhancers. Chromatin structure affects gene expression.

1125. Genetic Organization of Prokaryotes

Prokaryotes have circular DNA without a nucleus. Genes are often organized in operons with continuous coding sequences. Prokaryotes lack introns and have simpler regulation.

1126. Transformation

The process where bacteria take up free DNA from their environment, leading to genetic changes. It plays a role in horizontal gene transfer and genetic engineering.

1127. Transduction

Bacteriophages transfer bacterial DNA from one cell to another, facilitating gene exchange. It is important in bacterial evolution and biotechnology.

1128. Conjugation

A mechanism of DNA transfer between bacteria via direct contact using pili. It spreads antibiotic resistance genes among bacteria.

1129. Plasmids

Small circular DNA molecules independent of chromosomal DNA in bacteria. Plasmids often carry beneficial genes, including antibiotic resistance, and are used as vectors in genetic engineering.

1130. Transposons

Mobile DNA elements that can move within a genome, causing mutations or gene rearrangements. Transposons have applications in gene tagging and mutagenesis.

1131. Microbial Biotransformation

Microorganisms convert chemical compounds into structurally modified products using enzymatic reactions. It is applied in drug synthesis, detoxification, and bioremediation.

1132. Applications of Microbial Biotransformation

Used in producing steroids, antibiotics, and biofuels. It enhances drug efficacy and reduces environmental pollutants.

1133. Mutation

Changes in DNA sequence that may alter gene function. Mutations can be spontaneous or induced and lead to genetic diversity or disease.

1134. Types of Mutation

Include point mutations (substitution), insertions, deletions, and frameshift mutations. Mutations may be silent, missense, or nonsense affecting protein function.

1135. Mutants

Organisms or cells with mutations that display altered phenotypes. They are used in genetic studies to understand gene functions.

1136. Operon

A cluster of genes under the control of a single promoter, common in prokaryotes, allowing coordinated gene expression.

1137. Gene Expression Regulation in Prokaryotes

Controlled mainly at transcriptional level via repressors and activators binding operons.

1138. Chromatin Remodeling

In eukaryotes, DNA packaging into chromatin regulates gene accessibility and expression.

1139. Genetic Recombination

Exchange of genetic material between DNA molecules leading to genetic diversity.

1140. PCR (Polymerase Chain Reaction)

Amplifies specific DNA sequences exponentially, essential for genetic analysis, cloning, and diagnostics.

1141. Unit V

Here are **20 terminologies** with about **90 words each**, based on your request about fermentation, production, and blood products:

1142. Fermentation Methods

Fermentation is a biochemical process using microorganisms to convert substrates into desired products under controlled conditions. Methods include batch, fed-batch, and continuous fermentation. Batch fermentation is a closed system where all nutrients are added initially. Fed-batch allows periodic addition of nutrients, and continuous fermentation maintains steady-state production by continuous input and output.

1143. Media for Fermentation

Media provide essential nutrients for microbial growth during fermentation. It contains carbon, nitrogen, minerals, vitamins, and growth factors. Media can be defined (chemically known) or complex (natural extracts). The choice of media influences yield, growth rate, and product formation.

1144. Fermentation Equipment

Includes fermenters or bioreactors designed for microbial culture under controlled temperature, pH, aeration, and agitation. Equipment varies from small lab fermenters to large industrial bioreactors.

1145. Sterilization Methods

Crucial to prevent contamination. Methods include moist heat sterilization (autoclaving), dry heat, filtration, chemical sterilants, and radiation. Autoclaving at 121°C under pressure for 15-20 minutes is common for media and equipment.

1146. Aeration in Fermentation

Supplying oxygen to aerobic microorganisms is critical for respiration and metabolism. Aeration rate affects cell growth and product formation and is controlled by spargers or air diffusers.

1147. Stirring and Agitation

Mechanical mixing in fermenters ensures uniform nutrient distribution, temperature, and oxygen supply. Impellers or agitators rotate to mix culture broth, improving microbial growth and productivity.

1148. Large-Scale Fermenter Design

Industrial fermenters are large vessels with features like temperature control jackets, aeration systems, stirrers, pH and dissolved oxygen probes. Materials used are corrosion-resistant stainless steel.

1149. Control Systems in Fermenters

Include automatic regulation of temperature, pH, aeration, agitation speed, and foam control to optimize microbial growth and product formation.

1150. Production of Penicillin

A β-lactam antibiotic produced by Penicillium chrysogenum through submerged fermentation. The process requires optimized aeration and nutrient supply, followed by extraction and purification.

1151. Production of Citric Acid

Produced mainly by Aspergillus niger via submerged or surface fermentation. Requires acidic pH and high sugar concentration. Citric acid is used as a preservative and flavoring agent.

1152. Production of Vitamin B12

Synthesized by bacteria like Propionibacterium and Pseudomonas species. Vitamin B12 is essential for red blood cell formation and neurological function.

1153. Production of Glutamic Acid

Fermentation by Corynebacterium glutamicum produces glutamic acid, an amino acid widely used as a flavor enhancer (MSG).

1154. Production of Griseofulvin

An antifungal antibiotic produced by Penicillium species. Requires solid or submerged fermentation with controlled environmental conditions.

1155. Blood Product Collection

Whole blood is collected aseptically from donors under sterile conditions for therapeutic use or further processing.

1156. Processing of Whole Human Blood

Blood is separated into components—red cells, plasma, platelets—using centrifugation. Components are stored separately to maximize therapeutic use.

1157. Storage of Whole Blood

Stored at 1-6°C with anticoagulants, maintaining viability for up to 35-42 days depending on preservatives.

1158. Dried Human Plasma

Plasma is freeze-dried (lyophilized) for longer shelf-life and easier transport. Reconstituted with sterile water before transfusion.

1159. Plasma Substitutes

Synthetic or natural products that mimic plasma volume expansion, used in cases of blood loss when blood transfusion is unavailable.

1160. Quality Control in Fermentation

Includes monitoring microbial contamination, product yield, pH, temperature, and sterility of final product.

1161. Safety Considerations in Fermentation

Prevent contamination, maintain aseptic conditions, and ensure worker safety from exposure to biohazards.

BP606T. PHARMACEUTICAL QUALITY ASSURANCE (Theory)

1162. Quality Control (QC)

Quality Control involves the operational techniques and activities used to fulfill requirements for quality. It focuses on testing and inspection of products or services to ensure they meet predefined standards. QC identifies defects in finished products and prevents faulty items from reaching consumers. It is a reactive process aimed at detecting and correcting quality problems during or after production.

1163. Quality Assurance (QA)

Quality Assurance is a proactive process that ensures quality is built into the product by planning and systematic activities. It encompasses all planned and systematic actions necessary to provide confidence that a product or service meets specified requirements. QA aims to prevent defects by improving and standardizing processes throughout the production lifecycle.

1164. Good Manufacturing Practices (GMP)

GMP is a system ensuring products are consistently produced and controlled according to quality standards. It covers all aspects of production from raw materials, equipment, personnel, to documentation. Compliance with GMP minimizes risks such as contamination, mix-ups, and errors, ensuring safety, efficacy, and quality of pharmaceuticals.

1165. Total Quality Management (TQM)

TQM is an organization-wide approach focused on continuous improvement of products, services, and processes. It involves all employees, from top management to workers, in quality enhancement. Key elements include customer focus, process management, employee involvement, and integrated system approach to achieve long-term success.

1166. Elements of TQM

TQM's core elements are customer-focused organization, total employee involvement, process-centered approach, integrated system, strategic and systematic approach, continual improvement, fact-based decision making, and effective communication.

1167. Philosophies of TQM

TQM philosophies emphasize quality as everyone's responsibility, zero defects, continuous improvement, customer satisfaction, and long-term success over short-term profits.

1168. ICH Guidelines

The International Council for Harmonisation (ICH) develops guidelines to harmonize technical requirements for pharmaceuticals. It facilitates global drug registration, ensuring safety, quality, and efficacy. ICH guidelines cover quality (Q), safety (S), efficacy (E), and multidisciplinary topics (M).

1169. Purpose of ICH

ICH aims to reduce duplication of testing during drug development, speed up approvals, and ensure consistent quality and safety standards worldwide.

1170. Participants of ICH

ICH includes regulatory authorities and pharmaceutical industry representatives from Europe, Japan, and the United States, collaborating to develop harmonized guidelines.

1171. Process of Harmonization

ICH harmonization involves consensus building through expert working groups, public consultations, and adoption by regulatory agencies to create unified guidelines.

1172. QSEM Overview

QSEM stands for Quality, Safety, Efficacy, and Multidisciplinary guidelines. Q-series deals with quality aspects like stability, impurities, and manufacturing controls in pharmaceuticals.

1173. ICH Stability Testing Guidelines

These guidelines define protocols for testing drug stability under different environmental conditions to ensure shelf life and efficacy throughout product storage.

1174. Quality by Design (QbD)

QbD is a systematic approach to pharmaceutical development emphasizing product and process understanding. It integrates quality into design phases to ensure consistent performance and regulatory compliance.

1175. Elements of QbD Program

Key components include defining Quality Target Product Profile (QTPP), Critical Quality Attributes (CQA), risk assessment, design of experiments (DoE), and control strategy.

1176. Tools of QbD

Tools include risk management, process analytical technology (PAT), multivariate analysis, and statistical design of experiments to optimize quality.

1177. ISO 9000 Overview

ISO 9000 is a family of quality management standards focusing on meeting customer and regulatory requirements through effective quality systems.

1178. Benefits of ISO 9000

Benefits include improved product quality, customer satisfaction, process efficiency, and international recognition.

1179. Elements of ISO 9000

Elements include quality management system, management responsibility, resource management, product realization, and measurement, analysis, and improvement.

1180. Steps for ISO 9000 Registration

Steps include gap analysis, documentation development, implementation, internal audit, corrective actions, and certification audit by accredited bodies.

1181. NABL Accreditation

The National Accreditation Board for Testing and Calibration Laboratories (NABL) grants accreditation to labs demonstrating competence in testing and calibration

according to international standards. Principles include impartiality, confidentiality, and technical competence. The process involves application, assessment, corrective action, and periodic surveillance audits.

1182. Personnel Responsibilities

Personnel are responsible for adhering to GMP guidelines, following SOPs, maintaining hygiene, and ensuring product quality and safety. Clear job descriptions and accountability foster efficient operations and compliance with regulations.

1183. Personnel Training

Training involves educating employees on GMP, safety protocols, and job-specific skills. Continuous training ensures staff are updated with regulatory changes and quality standards, improving performance and reducing errors.

1184. Personal Hygiene

Good personal hygiene minimizes contamination risks in pharmaceutical manufacturing. Practices include regular hand washing, wearing protective clothing, and avoiding jewelry to maintain product safety and quality.

1185. Personal Records

Maintaining detailed personal records such as training history, health status, and responsibilities ensures traceability, compliance, and effective workforce management within GMP frameworks.

1186. Premises Design

Premises should be designed to facilitate efficient workflow, minimize contamination, and comply with regulatory standards. Separate areas for different processes and controlled access improve product safety.

1187. Construction and Plant Layout

Construction materials must be smooth, non-porous, and easy to clean. Plant layout should prevent cross-contamination, optimize movement of materials and personnel, and support hygienic operations.

1188. Premises Maintenance

Regular upkeep of premises prevents deterioration that could affect product quality. Maintenance includes repairs, pest control, and cleaning protocols aligned with GMP.

1189. Sanitation

Sanitation programs ensure cleanliness of facilities and equipment, using validated cleaning agents and schedules to prevent microbial contamination and maintain GMP compliance.

1190. Environmental Control

Monitoring and controlling temperature, humidity, air quality, and pressure differentials are crucial to maintain sterile conditions and product integrity in manufacturing areas.

1191. Utilities in Pharmaceutical Plants

Utilities include water, compressed air, steam, and HVAC systems essential for production and sanitation. They must meet quality standards to avoid contaminating products.

1192. Maintenance of Sterile Areas

Sterile areas require strict control to maintain aseptic conditions, including validated cleaning, environmental monitoring, and personnel hygiene to ensure product sterility.

1193. Control of Contamination

Measures such as controlled access, air filtration, cleaning protocols, and personnel training are implemented to prevent microbial and particulate contamination during production.

1194. Equipment Selection

Equipment must be suitable for intended processes, made of compatible materials, easy to clean, and meet regulatory standards to ensure consistent product quality.

1195. Purchase Specifications for Equipment

Detailed specifications guide procurement to ensure equipment meets quality, performance, and safety requirements, preventing operational issues.

1196. Equipment Maintenance

Routine maintenance, calibration, and validation keep equipment in proper working order, minimizing breakdowns and ensuring product quality and compliance.

1197. Raw Material Selection

Raw materials must meet defined quality standards and specifications. Proper selection ensures product consistency, efficacy, and safety.

1198. Purchase Specifications for Raw Materials

Specifications include purity, identity, quality tests, and acceptable limits, ensuring suppliers provide compliant materials.

1199. Storage of Raw Materials

Raw materials are stored in controlled conditions to prevent degradation or contamination. Proper labeling, segregation, and inventory management support quality assurance.

1200. Maintenance of Raw Material Stores

Regular cleaning, pest control, and environmental monitoring maintain material integrity. Records track stock movement to avoid expiration or mix-ups.

1201. Documentation for Equipment and Raw Materials

Complete records of equipment validation, maintenance, and raw material testing ensure traceability, regulatory compliance, and facilitate audits.

1202. Quality Control of Containers

Quality control tests for containers involve checking physical and chemical properties such as strength, compatibility, leakage, sterility, and resistance to environmental factors.

Containers must protect the product from contamination, deterioration, and ensure safe storage.

1203. Quality Control of Rubber Closures

Rubber closures are tested for elasticity, impermeability, chemical inertness, and absence of contaminants. Tests include microbiological cleanliness, tensile strength, and compatibility with product to prevent leachables or contamination.

1204. Quality Control of Secondary Packing Materials

Secondary packaging such as cartons, labels, and seals are tested for durability, print clarity, and resistance to moisture and abrasion to ensure product protection and regulatory compliance.

1205. Good Laboratory Practices (GLP) Overview

GLP are quality systems governing nonclinical laboratory studies to ensure data integrity, reproducibility, and regulatory compliance. They cover organization, personnel, facilities, equipment, and study conduct.

1206. Organization in GLP

Defines roles and responsibilities, ensuring qualified personnel manage studies, maintain documentation, and adhere to protocols, promoting accountability and data reliability.

1207. Personnel in GLP

Requires training, competence, and clear job descriptions. Personnel must follow SOPs and maintain records to guarantee study quality and compliance.

1208. Facilities in GLP

Laboratories must have adequate space, controlled environments, and segregation to prevent cross-contamination and maintain study integrity.

1209. Equipment in GLP

Equipment used must be calibrated, maintained, and validated. Proper operation ensures accuracy and reliability of test results.

1210. Testing Facilities Operation

Testing operations follow SOPs for sample handling, testing procedures, and data recording to maintain standardization and reproducibility.

1211. Test and Control Articles

Materials used in studies must be well-characterized, stored properly, and documented to ensure validity of results.

1212. Protocol for Conduct of Nonclinical Laboratory Study

A written plan detailing objectives, methods, responsibilities, and analysis procedures. Adherence ensures study consistency and regulatory acceptance.

1213. Records in GLP

Comprehensive documentation of study plans, raw data, observations, and reports ensures traceability and supports regulatory inspections.

1214. Reports in GLP

Final study reports summarize methods, data, interpretations, and conclusions. They provide a basis for regulatory decisions.

1215. Disqualification of Testing Facilities

Facilities may be disqualified if they fail to comply with GLP, compromising data integrity. This affects credibility and regulatory approvals.

1216. Physical Tests for Containers

Tests include tensile strength, impact resistance, leak testing, and dimensional checks to ensure container robustness.

1217. Chemical Tests for Containers

Assess potential interactions with contents, extractables, and leachables to ensure safety and efficacy.

1218. Microbiological Tests for Rubber Closures

Include sterility, microbial contamination levels, and endotoxin testing to prevent product contamination.

1219. Labeling Compliance

Ensures that secondary packaging has accurate, legible, and compliant labeling for safe identification and usage.

1220. Environmental Controls in Testing Facilities

Control of temperature, humidity, and cleanliness is vital to prevent interference in test outcomes.

1221. Standard Operating Procedures (SOPs) in GLP

SOPs provide detailed instructions for all laboratory activities, ensuring uniformity, compliance, and quality assurance.

1222. Complaint

A complaint is any written or oral communication alleging deficiencies related to identity, quality, durability, reliability, safety, effectiveness, or performance of a pharmaceutical product.

1223. Complaint Evaluation

The process of investigating complaints to determine their validity, root cause, and impact on product quality. Evaluation helps in corrective actions and prevention of recurrence.

1224. Handling of Returned Goods

Returned products are quarantined, inspected, and evaluated for quality before deciding on reprocessing, re-labeling, or destruction to ensure consumer safety.

1225. Product Recall

A systematic withdrawal of a defective or potentially harmful product from the market to protect public health, involving communication with regulatory authorities and customers.

1226. Waste Disposal

Proper disposal of pharmaceutical waste ensures environmental safety and regulatory compliance. Methods include incineration, chemical treatment, or controlled landfill.

1227. Batch Formula Record

A detailed document specifying the materials, quantities, processing instructions, and controls for manufacturing a specific batch, ensuring consistency and traceability.

1228. Master Formula Record

A comprehensive document containing the standardized formula and manufacturing process used as a reference for batch production and quality control.

1229. Standard Operating Procedure (SOP)

Written instructions that describe routine or repetitive activities, ensuring uniformity, compliance, and quality assurance across operations.

1230. Quality Audit

A systematic, independent examination to assess compliance with quality standards, identify gaps, and recommend improvements.

1231. Quality Review

Periodic assessment of manufacturing and quality control data to verify adherence to standards and continuous improvement.

1232. Quality Documentation

Includes all documents related to quality control and assurance such as SOPs, test records, validation protocols, and audit reports, ensuring traceability and regulatory compliance.

1233. Batch Manufacturing Record

Records all steps of the batch production process, including raw materials used, equipment, processing parameters, and in-process controls for traceability.

1234. Reports and Documents

Comprehensive records of production, quality testing, investigations, and regulatory submissions necessary for product release and audits.

1235. Distribution Records

Track the movement of products from manufacturing to end-users, essential for recall management and supply chain traceability.

1236. Complaint Handling Procedure

Defines the process for receiving, documenting, investigating, and responding to complaints to maintain product quality and customer satisfaction.

1237. Recall Procedure

An established process outlining steps to promptly remove defective products from the market, minimizing risk to patients and maintaining regulatory compliance.

1238. Returned Goods Control

Ensures returned products are not reused or resold without proper evaluation and authorization, protecting product integrity.

1239. Documentation Control

A system to manage creation, revision, approval, and archiving of documents to ensure accuracy and accessibility.

1240. Waste Segregation

Separating pharmaceutical waste based on type (chemical, biological, hazardous) to facilitate safe and compliant disposal.

1241. Regulatory Compliance in Documentation

Adherence to regulatory requirements for documentation ensures product safety, efficacy, and legal accountability during inspections.

1242. Calibration

Calibration is the process of configuring an instrument to provide accurate and precise measurements by comparing it with a standard or reference. It ensures data reliability and consistency in pharmaceutical analysis.

1243. Qualification

Qualification is a documented process proving that equipment or systems are installed, operated, and perform as intended. It includes Installation Qualification (IQ), Operational Qualification (OQ), and Performance Qualification (PQ).

1244. Validation

Validation is the documented evidence demonstrating that a process, method, or system consistently produces results meeting predetermined criteria, ensuring product quality and regulatory compliance.

1245. Importance of Validation

Validation ensures safety, efficacy, and quality of pharmaceutical products, minimizing risks and complying with regulatory standards. It enhances process control and product consistency.

1246. Types of Validation

Includes process validation, cleaning validation, equipment validation, analytical method validation, computer system validation, and facility validation, each focusing on different aspects of production and quality control.

1247. Validation Master Plan (VMP)

A comprehensive document outlining the company's approach, strategy, and responsibilities for validation activities, providing a roadmap for efficient validation execution.

1248. Calibration of pH Meter

The procedure to adjust and verify the pH meter readings using standard buffer solutions to ensure accurate measurement of acidity or alkalinity.

1249. Qualification of UV-Visible Spectrophotometer

Process includes verifying installation, operation, and performance parameters such as wavelength accuracy, photometric accuracy, and baseline stability to ensure reliable analysis.

1250. Analytical Method Validation

Confirms that an analytical procedure is suitable for its intended purpose by evaluating parameters like accuracy, precision, specificity, linearity, range, detection, and quantitation limits.

1251. Good Warehousing Practice (GWP)

GWP involves proper storage, handling, documentation, and inventory control of materials and products to maintain quality, prevent contamination, and ensure traceability.

1252. Materials Management

Involves procurement, storage, handling, and distribution of raw materials, intermediates, and finished products to optimize inventory and reduce waste.

1253. Installation Qualification (IQ)

Verification that equipment or systems are installed according to manufacturer's specifications and design requirements.

1254. Operational Qualification (OQ)

Testing equipment or system operations to verify it performs as intended throughout all operating ranges.

1255. Performance Qualification (PQ)

Confirming that equipment or processes perform effectively and reproducibly under real operational conditions.

1256. Process Validation

Documented evidence that a manufacturing process consistently produces a product meeting predetermined specifications.

1257. Cleaning Validation

Ensures cleaning procedures effectively remove residues to prevent contamination and ensure product safety.

1258. Computer System Validation (CSV)

Verification that software and computerized systems function correctly and comply with regulatory requirements.

1259. Shelf Life

Period during which a product maintains its intended quality, safety, and efficacy under recommended storage conditions.

1260. Inventory Control

Techniques used to manage stock levels, minimize shortages or excesses, and ensure availability of materials for production.

1261. Environmental Control in Warehousing

Maintaining temperature, humidity, and cleanliness standards in storage areas to protect product quality and prevent degradation.

About the Editors

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