FACULTY OF PHARMACY AT THE MEDICAL UNIVERSITY OF SOFIA

DEPARTMENT OF PHARMACOLOGY, PHARMACOTHERAPY AND TOXICOLOGY

SYNOPSIS FOR STATE EXAMINATION IN PHARMACOLOGY AND TOXICOLOGY

Academic year 2023/2024

At the exam, students retrieve two questions – one on pharmacology and one on toxicology, which must be written in detail, followed by an oral examination. Topics should include classification and exemplar drugs written with the international non-proprietary names, pharmacokinetic properties and route of administration, mechanism of action, side effects and clinical application of the relevant drug class.

Pharmacology

1. Anxiolytics, sedative-hypnotics and antipsychotics.
2. Antidepressants, psychostimulants and nootropics.
3. Drugs for the treatment of epilepsy and central muscle relaxants.
4. Medicines for the treatment of neurodegenerative diseases - Parkinson's disease, Alzheimer's disease. Pharmacological approaches in multiple sclerosis.
5. General and local anesthetics, premedication agents, peripheral muscle relaxants.
6. Sympathomimetics and sympatholytics.
7. Parasympathomimetics and parasympatholytics.
8. Medicines for the treatment of asthma, COPD. Antitussives, expectorants and mucolytics. Nasal decongestants.
9. Antiallergic drugs - H1 blockers, glucocorticosteroids. Pharmacological approaches in anaphylactic shock and angioedema.
10. Opioid analgesics and antagonists - pharmacodynamics, clinical application.
11. Non-steroidal anti-inflammatory drugs, non-opioid analgesics.
12. Medications to treat neuropathic pain and migraine.
13. Drugs affecting the digestive system - anti-ulcer, laxative and anti-diarrheal agents.
14. Hepatoprotectors and pharmacotherapeutic approaches in cirrhosis.
15. Antiemetics. Approaches to modulating nausea and vomiting in anticancer chemotherapy and radiotherapy.
16. Medicines affecting hematopoiesis (iron salts, vitamin B12, folic acid, erythropoietins, colony-stimulating factors).
17. Drugs affecting blood coagulation, platelet aggregation and fibrinolysis. Hemostatics, neutralizing drugs/antidotes in drug-induced hemorrhages.

18. Inotropic agents (sympathomimetics, digitalis glycosides, phosphodiesterase inhibitors) and other drugs for the treatment of heart failure.
19. Antihypertensive drugs.
20. Diuretics and mineralocorticoid receptor antagonists.
21. Antiarrhythmic and antianginal drugs.
22. Antihyperlipidemic agents (fibrates, statins, polymer resins, cholesterol resorption inhibitors, PCSK-9 antagonists, polyunsaturated fatty acids, etc.).
23. Medicines for the treatment of rheumatoid arthritis, gout and chondroprotectors.
24. Medicines affecting thyroid function and medicines to treat osteoporosis.
25. Antidiabetic drugs (insulins, insulin analogs, sulfonylureas, biguanidine drugs, thiazolidinediones, incretin-based therapies, SGLT-2 inhibitors).
26. Glucocorticoids - systemic and local drugs, pharmacological characteristics, adverse drug reactions and clinical application.
27. Female sex hormones and antihormones. Contraceptives.
28. Male sex hormones and antihormones. Medicines to treat erectile dysfunction.
29. Antibacterial drugs suppressing cell wall synthesis - beta-lactam, glycopeptide antibiotics, etc.
30. Antibacterial drugs suppressing protein synthesis - aminoglycosides, tetracyclines, macrolides, lincosanoids, streptogramins, etc.
31. Fluoroquinolones, sulfonamides, and trimethoprim. Uroantiseptics.
32. Medicines to treat tuberculosis and other mycobacterial infections.
33. Antimycotics (polyenes, azoles, allylamines, echinocandins, etc.).
34. Antiprotozoal drugs for the treatment of malaria, toxoplasmosis, trypanosomiasis, leishmaniasis; nitroimidazoles, etc. Anthelmintic drugs.
35. Antineoplastic drugs - alkylating agents and platinum complexes, antimetabolites.
36. Antitumor antibiotics, plant-derived antineoplastic drugs and other mitotic inhibitors.
37. Antineoplastic agents for targeted therapy - monoclonal antibodies, antimetabolites, proteasome inhibitors, antiangiogenic agents.
38. Antiviral drugs to treat HIV infection/AIDS.
39. Antiviral drugs for the treatment of influenza, HSV/VZV-infections, hepatitis C, COVID-19.
40. Immunosuppressants, immunomodulators and vaccines.
41. Monoclonal antibodies, aptamers, fusion proteins, agents for gene therapy - pharmacological features and application.

42. Dermatological drugs - topical corticosteroids, retinoids, anti-infectives, PUVA, keratolytics, etc.
43. Ophthalmic drugs - drugs for the treatment of glaucoma - prostaglandins, beta-blockers, carbonic anhydrase inhibitors, etc., local antibiotics, anti-inflammatory drugs.

Toxicology

1. Biotransformation – significance, functions, localization (hepatic and extrahepatic). Toxicological features of genetic polymorphism. Enzyme induction and enzyme inhibition – mechanisms and clinical relevance.
2. Bioactivation and detoxification - mechanisms, significance.
3. Adverse drug reactions - definition, basic concepts, classification. Drug safety - monitoring of adverse drug reactions.
4. Toxicological aspects of drug use during pregnancy and lactation.
5. Toxicological aspects of drug interactions at the pharmacokinetic and pharmacodynamic level. Mechanisms, clinical relevance.
6. General principles of treatment in acute intoxications. Antidotes - classification and application.
7. Drug abuse and drug dependence - types, characteristics. Withdrawal syndrome.
8. Drug dependence of alcohol-barbiturate type. Acute intoxications and antidotes.
9. Addiction to psychostimulants: amphetamines, cocaine and hallucinogens.
10. Tolerance, mental and physical dependence to opioids and opportunities for therapeutic modulation. Acute intoxications with opioid analgesics - morphine and analogues. Clinical features and treatment.
11. Drug allergy - types and specific features.
12. Drug-induced lung damage. Genetic polymorphism of N-acetyltransferases and CYP-450 isoforms (CYP2C9, CYP2C19, CYP2D6).
13. Drug-induced damage of the cardiovascular system – cardiotoxicity, hypertension, ECG changes and arrhythmias, drug-induced electrolyte and metabolic disorders. Approaches to cardioprotection.
14. Drug-induced hematological toxicity. Antidotes for drug-induced hemorrhages.
15. Drug-induced damage to the gastro-intestinal tract. Drug-induced liver damage - acute and chronic intoxication. Antidote therapy.
16. Drug-induced damage to the excretory system.
17. Drug-induced dermatological damage. Toxic damage to the sensory organs.
18. Xenobiotics affecting the reproductive functions and the endocrine system.

19. Adverse drug reactions of antibiotics and chemotherapeutics - sulfonamides, antitubercular agents, fluoroquinolones. Glucose-6-phosphate dehydrogenase deficiency and drug-induced hemolytic anemia. Specific features of drug safety during antibiotic treatment - dysbacteriosis, pseudomembranous colitis.
20. Nicotine – toxicokinetics and toxicodynamics. Nicotine addiction – molecular mechanisms and treatment.
21. Toxicological characteristics of the most important biologically active compounds and toxins of plant or animal origin, mycotoxins.
22. Alcohol – toxicokinetics and toxicodynamics. Alcohol dependence. Disulfiram-like reactions and drug interactions with alcohol.

Recommended literature:

1. Katzung, Bertram G. Basic & Clinical Pharmacology (14th). New York: McGraw-Hill; 2018.
2. Goodman & Gilman's the Pharmacological Basis of Therapeutics, Björn C. Knollmann, Laurence L. Brunton (Eds.), McGraw Hill, 2022.
3. Casarett & Doull's Toxicology: The basic science of poisons. 9-th ed., by Klaasen CD (ed.); 2019.
4. LEE, Byung-Mu; KACEW, Sam. Lu's basic toxicology: fundamentals, target organs, and risk assessment. CRC press, 2012.
5. World Health Organization, Guidelines for poison control, II. Technical guidance - 7. Antidotes and their availability 2020

https://www.who.int/ipcs/publications/training_poisons/guidelines_poison_control/