

STATE EXAM QUESTIONS ON PHARMACOLOGY AND TOXICOLOGY
for postgraduate students of Pharmacology and Toxicology
valid from the academic year 2021/2022

1.

- Adrenergic mediation (adrenergic neurotransmission, types of receptors, their localization and function, classification of drugs affecting the sympathetic nervous system into drugs acting directly and indirectly).
- Hypnotics, sedatives. Analgesia.
- Toxicity of heavy metals (especially Pb, Hg, As, Cd, Fe, Cu) and their compounds. Risks of chronic exposure. Therapeutic options (including antidotes).

2.

- Cholinergic mediation (cholinergic neurotransmission, cholinergic receptors, their localization and functions, main uses of individual groups of cholinergic substances).
- Antibacterial agents: Cephalosporins; oxazolidinones, polypeptides.
- Cyanide poisoning. Mechanism of action, metabolism. Treatment of poisoning.

3.

- Basic pharmacokinetic parameters affecting steady-state drug levels - elimination rate constant, elimination half-life, drug clearance, renal and non-renal clearance.
- Non-steroidal anti-inflammatory drugs, mechanism of action, therapeutic use, adverse effects.
- Combination of antimicrobials; advantages and disadvantages, examples of synergism and antagonism of individual combinations. Antibiotic resistance. Principles of rational use of antibiotics.

4.

- Drug distribution in the body (volume of distribution - importance for drug dosing); one and more compartment systems; zero- and first-order pharmacokinetics.
- General anesthetics and premedication in general anesthesia. Intoxication by inhalation general anesthetics in terms of time and quantity.
- Antiparasitic drugs: antiprotozoals; clinically used anthelmintics and ectoparasitics.

5.

- Pharmacokinetics; basic parameters and formulas for the calculation of pharmacokinetic parameters, the importance of individual parameters.
- Non-insulin antidiabetics.
- Pharmacotherapy of allergic reactions and anaphylactic shock.

6.

- Dependence of drug response on dose/concentration (types of doses, dose/concentration-response relationship, therapeutic range, therapeutic index). Lethal dose, NOAEL in the preclinical studies.
- Anticoagulants, including NOAC/DOAC (new/direct oral anticoagulants) and their antidotes.
- Drugs used to treat obesity and metabolic syndrome.

7.

- Diuretics (classification, mechanisms of action; therapeutic use of individual groups of diuretics).
- Antiepileptics.
- Biotransformation of xenobiotics. Main types of biotransformation reactions. The importance of knowledge about metabolism in the toxicological diagnosis of poisoning. Toxic metabolites, examples.

8.

- Inotropes (drugs with positive inotropic effect); drugs used in acute heart failure.
- Current possibilities of pharmacotherapy of Parkinson's disease, Alzheimer's disease, Huntington's chorea and multiple sclerosis.
- Methods for detecting and predicting the toxicity of substances (e.g. determination of acute, subchronic and chronic toxicity, *in vitro*, *in silico* methods, QSAR - quantitative/structure-activity relationship)

9.

- Teratogenic effects of drugs. Specifics of pharmacotherapy during pregnancy and lactation - in general and in selected associated diseases (e.g. hypertension, diabetes mellitus, bronchial asthma, infectious diseases, epilepsy, thromboembolism).
- Antibiotics: macrolides, tetracyclines, lincosamides, amphenicols.
- Neuroleptics (antipsychotics). Neuroleptic abuse, laboratory diagnostics, treatment.

10.

- Biotransformation of drugs and its importance for the excretion of drugs from the body (types of biotransformation processes, enzyme induction and inhibition).
- β sympatholytics / β blockers (classification; cardiac and non-cardiac indications for administration, adverse reactions).
- Non-opioid analgesics. Principles of pain treatment. Intoxication with non-opioid analgesics; risks of chronic use.

11.

- Clinical drug trials, bioequivalence studies, evidence-based pharmacotherapy.
- Second-line (second-option) antihypertensives. Possibilities of pharmacotherapy of pulmonary hypertension.
- Antivirals (overview; individual groups).

12.

- Alpha and beta sympathomimetics (classification according to selectivity, therapeutic uses, adverse effects).
- Glucocorticoids: pharmacotherapy.
- Ethanol: pharmacokinetics, metabolism, acute and chronic effects. Interactions of ethanol with drugs and addictive substances.

13.

- Adverse effects of drugs - classification (dose dependence - specific examples). The importance of pharmacovigilance.
- Antidepressants and mood stabilizers (antimanic drugs).
- Androgens, anabolic steroids, and antiandrogens - effects and therapeutic uses; abuse.

14.

- Beta-lactam antibiotics (excluding cephalosporins).
- Antirheumatics and other drugs used in joint diseases, including gout.
- Agonists and antagonists of serotonin. Serotonin syndrome, manifestations and causes.

15.

- Specifics of pharmacotherapy and drug dosing in pediatric and geriatric populations. Dosage adjustment depending on the function of the elimination organs.
- Opioid analgesics. Problems of chronic use; opioid and opiate dependence and treatment options.
- Antihypertensives - an overview, suitable and inappropriate combinations.

16.

- Time course of drug levels in the body and its significance for substance dosing optimization. Therapeutic monitoring of drug levels (examples).
- Antiasthmatic drugs. Possibilities of COPD (chronical obstructive pulmonary disease) pharmacotherapy.
- Therapeutic options to reduce the activity of the renin-angiotensin-aldosterone system; their importance in the treatment of cardiovascular diseases.

17.

- Adverse effects of antibiotics (allergic reactions, toxic effects on the nervous system, musculoskeletal system, gastrointestinal, hematopoietic, cardiovascular, nephrotoxicity, hepatotoxicity, etc.), interactions of antibiotics with other drugs and food - examples, effects on enterohepatic circulation.
- Coronary vasodilators and other drugs used in coronary heart disease.
- Antiemetics, antimigraine drugs.

18.

- First-line antihypertensives.
- Anxiolytics.
- Conventional anticancer therapy - principles of chemotherapy; alkylating and intercalating agents (mechanism of action, adverse effects, toxicity).

19.

- Antitussives and expectorants; decongestants. Symptomatic pharmacotherapy of influenza, colds, and rhinitis.
- Hypolipidemic drugs.
- Diagnosis and treatment of intoxications. Basic approaches to the treatment of acute poisoning, antidotes.

20.

- Narcotic and psychotropic substances. Abuse and societal risks. Therapy of acute overdoses.
- Antituberculous drugs.
- Drugs used to treat benign prostatic hyperplasia, erectile dysfunction, urinary incontinence.

21.

- Parasympathomimetic drugs (classification, indications, adverse effects).
- Antifungal drugs for general and local use.
- Postmortem forensic toxicology. Postmortem redistribution, artifacts. Limits of interpretation of toxicological findings.

22.

- Calcium channel blockers.
- Medicines used to treat gastroduodenal ulcers. Intestinal anti-inflammatory and other drugs used in idiopathic bowel diseases.
- Poisoning caused by organophosphates; mechanism of action; diagnosis, therapy of poisoning.

23.

- Mechanism of action of drugs at the molecular level; target structures of specific drug action; drugs with receptor-independent effects (examples).
- Antiplatelet agents, fibrinolytics, antifibrinolytics, hemostatics.
- Hypothalamic and pituitary hormones and their inhibitors - overview, clinical use. Thyroid drugs.

24.

- Interindividual variability in patient sensitivity to drugs (causes). Pharmacogenetics (meaning, practical use, examples). Personalized medicine.
- Anticholinergic substances, parasympatholytics (overview, indications, side effects).
- Female sex hormones, hormonal contraception in women, hormone replacement therapy.

25.

- Alpha-adrenergic sympatholytics; direct vasodilators; drugs used in diseases of the venous system (venoactive drugs).
- Drugs affecting bone mineral homeostasis, treatment of osteoporosis.
- Dangerous poisonous mushrooms and plants; examples; manifestations of acute poisoning; treatment options.

26.

- Drug delivery routes to the body (relationship of the route of administration to the rate and duration of action of the drug, relationship to the pharmacokinetics of the substance); dosage forms.
- Conventional antitumor (chemo) therapy - classification, resistance to cytotoxic substances; antimetabolites, antibiotics, and plant alkaloids in the treatment of cancer.
- Pancreatic hormones; insulin (mechanism of action, types of insulins and their use in the treatment of diabetes mellitus).

27.

- Local anesthetics. Intoxication with local anesthetics.
- Tocolytics, uterotonics and drugs inducing uterine activity. Drugs affecting lactation.
- Blood, plasma, blood substitutes; antianemics.

28.

- Pharmacotherapy of chronic heart failure.

- Antibacterial chemotherapeutics: nitroimidazoles; sulfonamides and related substances; fluoroquinolones; nitrofurans. Antimicrobial agents for the treatment of urinary tract infections.

- Drug overdose. Toxic pathognomonic syndromes. Limitations of interpretation of levels in an uncontrolled state (intentional and unintentional overdose of drugs).

29.

- Biological and gene therapy, orphan drugs - meaning, examples.

- Peripheral and central muscle relaxants.

- Nootropics and psychostimulants; therapeutic use, abuse, addiction, treatment of addiction.

30.

- Targeted antitumor pharmacotherapy: hormonal and antihormonal substances in the treatment of cancer, biological drugs, kinase inhibitors, immunotherapy.

- Laxatives and antidiarrheal drugs.

- Methanol, isopropanol, and glycols - metabolism, acute and chronic toxicity, treatment options for acute intoxication.

31.

- Basic quantitative aspects of drug-receptor interaction (affinity, intrinsic activity); agonism, partial agonism, competitive and non-competitive antagonism (plot graphically on the dose/concentration effect curve).

- Immunosuppressants, immunomodulators, immunostimulants (relationship between immunotherapy and anticancer pharmacotherapy).

- Problems of nicotine addiction, possibilities of pharmacotherapeutic intervention. Cigarette smoking and drug interactions.

32.

- Drugs used in cardiology for acute conditions (cardiac arrest, acute heart failure, acute coronary syndrome, hypertensive crisis).

- Antispasmodics of the gastrointestinal tract and drugs affecting intestinal motility. Spasmoanalgetics. Flatulence-reducing drugs. Hepatoprotective drugs.

- Hallucinogenic substances; mechanism of action, abuse, social and health risks.

33.

- Drug interactions: types of interactions, interactions with food (examples). Polypharmacy. Effects of simultaneous action of multiple drugs/xenobiotics (additivity, synergism, potentiation, antagonism).

- Classification of antibacterial agents; aminoglycosides and glycopeptides. Antibiotics for topical use.

- Adrenal cortex hormones (pharmacodynamic effects, indications, adverse effects) and their inhibitors.

34.

- Antihistamines (classification, therapeutic indications, adverse effects).

- Antiarrhythmics (classification, mechanism of action, preferential clinical use).

- Mutagenicity and carcinogenicity - definition, and the role of mutations in the process of carcinogenesis, examples of carcinogenic substances.

Recommended literature:

- KATZUNG BG, KRUIDERING-HALL M, TREVOR AJ. EDS. . *Katzung & Trevor's Pharmacology: Examination & Board Review*, 12e. USA: McGraw Hill Education, 2019, ISBN 978-1-259-64102-2.
- R.A. HARVEY, CLARK M.A, R. FINKEL, J.A. RAY, K.W. WHALEN (EDS.). *Lippincott's illustrated reviews: Pharmacology*. Philadelphia, US: Lippincott Williams & Wilkins, 2018, s. 608. ISBN 10-1451113145.
- H.P. RANG, M.M. DALE, J.M. RITTER (EDS.). . *Pharmacology. 8th edition*, London, UK: Churchill Livingstone, 2019, s. 776. ISBN 10-0702053627.
- L.L. BRUNTON, K.L. PARKER (EDS.), D.K BLUMENTHAL., I.L BUXTON. . *Goodman & Gilman's Manual of Pharmacology and Therapeutics*. New York City, 2041, s. 642. ISBN 10-0071443436.
- HEINZ LÜLLMANN , KLAUS MOHR , LUTZ HEIN . *Color Atlas of Pharmacology 5th Edition*. Georg Thieme Verlag, 2018, ISBN 978-3132410657.
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