Learning Objectives

Pharmacology of Organ Systems

1. List 4 major groups of antihypertensive drugs, and give examples of drugs in each group. (Renin inhibitors are not considered an independent major group; can you name the one available drug that acts by this mechanism?).
2. Describe the compensatory responses, if any, to each of the 4 major types of antihypertensive drugs.
3. List the major sites of action of sympathoplegic drugs in research or clinical use, and give examples of drugs that act at each site.
4. List the 4 mechanisms of action of vasodilator drugs.
5. List the major antihypertensive vasodilator drugs and describe their effects.
6. Describe the differences between the 2 types of angiotensin antagonists.
7. List the major toxicities of the prototype antihypertensive agents.
8. Describe the pathophysiology of effort angina and vasospastic angina and the major determinants of cardiac oxygen consumption.
9. List the strategies and drug targets for relief of anginal pain.
10. Contrast the therapeutic and adverse effects of nitrates, beta blockers, and calcium channel blockers when used for angina.
11. Explain why the combination of a nitrate with a beta blocker or a calcium channel blocker may be more effective than either alone.
12. Explain why the combination of a nitrate and sildenafil is potentially dangerous.
13. Explain why the combination of a nitrate and sildenafil is potentially dangerous.
14. Describe the differences between HFrEF and HFpEF.
15. Describe the strategies and list the major drug groups used in the treatment of acute heart failure and chronic failure.
16. Describe the mechanism of action of digitalis and its major effects. Indicate why digitalis is no longer considered a first-line therapy for chronic heart failure.
17. Describe the nature and mechanism of digitalis's toxic effects on the heart.
18. List positive inotropic drugs other than digitalis that have been used in heart failure.
19. Explain the beneficial effects of diuretics, vasodilators, ACE inhibitors, and other drugs that lack positive inotropic effects in heart failure.
20. Describe the distinguishing electrophysiologic action potential and ECG effects of the 4 major groups of antiarrhythmic drugs and adenosine.
21. List 2 or 3 of the most important drugs in each of the 4 groups.
22. List the major toxicities of those drugs.
23. Describe the mechanism of selective depression by local anesthetic antiarrhythmic agents.
24. Explain how hyperkalemia, hypokalemia, or an antiarrhythmic drug can cause an arrhythmia.
25 List 5 major types of diuretics and relate them to their sites of action.
26. Describe 2 drugs that reduce potassium loss during sodium diuresis.

27. Describe a therapy that reduces calcium excretion in patients who have recurrent urinary stones.
28. Describe a treatment for severe acute hypercalcemia in a patient with advanced carcinoma.
29. Describe a method for reducing urine volume in nephrogenic diabetes insipidus.
30. Describe a method for increasing water excretion in SIADH secretion.
31. Describe a group of drugs that reduce glucose reabsorption in the nephron and cause a concomitant diuresis.
32. List the major applications and the toxicities of acetazolamide, thiazides, loop diuretics, and potassium-sparing diuretics.
33. List the 3 major classes of anticlotting drugs and compare their usefulness in venous and arterial thromboses.
34. Name 3 types of anticoagulants and describe their mechanisms of action.
35. Explain why the onset of warfarin's action is relatively slow.
36. Compare the oral anticoagulants, standard heparin, and LMW heparins with respect to pharmacokinetics, mechanisms, and toxicity.
37. Give several examples of warfarin's role in pharmacokinetic and pharmacodynamic drug interactions.
38. Diagram the role of activated platelets at the site of a damaged blood vessel wall and show where the 4 major classes of antiplatelet drugs act.
39. Compare the pharmacokinetics, clinical uses, and toxicities of the major antiplatelet drugs.
40. Compare and contrast the mechanism of action, clinical uses, and toxicities of the oral anticoagulants (warfarin, rivaroxaban, and dabigatran).
41. List 3 drugs used to treat disorders of excessive bleeding.
42. Describe the proposed role of lipoproteins in the formation of atherosclerotic plaques.
43. Describe the dietary management of hyperlipidemia.
44. List the 5 main classes of drugs used to treat hyperlipidemia. For each, describe the mechanism of action, effects on serum lipid concentrations, and adverse effects.
45. On the basis of a set of baseline serum lipid values, propose a rational drug treatment regimen.
46. Discuss the merits of combined drug therapy for some diseases, and list 3 rational drug combinations.
47. Explain the difference between voltage-gated and ligand-gated ion channels.
48. List the criteria for accepting a chemical as a neurotransmitter.
49. Identify the major excitatory and inhibitory CNS neurotransmitters in the CNS.
50. Identify the sites of drug action at synapses and the mechanisms by which drugs modulate synaptic transmission.
51. Give an example of a CNS drug that influences neurotransmitter functions at the level of (a) synthesis, (b) metabolism, (c) release, (d) reuptake, and (e) receptor.
52. Identify major drugs in each sedative-hypnotic subgroup.
53. Recall the significant pharmacokinetic features of the sedative-hypnotic drugs commonly used for treatment of anxiety and sleep disorders.
54. Describe the proposed mechanisms of action of benzodiazepines, barbiturates, and zolpidem.

55. List the clinical uses and adverse effects of the major sedative-hypnotics.
56.Identify the distinctive properties of buspirone, eszopiclone, ramelteon, zaleplon, and zolpidem.
57. Describe the symptoms and management of overdose of sedative-hypnotics and ithdrawal from physiologic dependence.
58. Sketch the biochemical pathways for ethanol metabolism and indicate where fomepizole and disulfiram act.
59.Summarize characteristic pharmacodynamic and pharmacokinetic properties of ethanol.
60.Relate blood alcohol levels in a nontolerant person to CNS depressant effects of acute alcohol ingestion.
61. Identify the toxic effects of chronic ethanol ingestion.
62. Describe the fetal alcohol syndrome.
63. Describe the treatment of ethanol overdosage.
64. Outline the pharmacotherapy of (1) the alcohol withdrawal syndrome and (2) alcohol-use disorder.
65. Describe the toxicity and treatment of acute poisoning with (1) methanol and (2) ethylene glycol.
66. Describe the main pharmacokinetic features, and list the adverse effects of carbamazepine, phenytoin, and valproic acid.
67. Identify the mechanisms of antiseizure drug action at the levels of specific ion channels or neurotransmitter systems.
68. List the drugs of choice for partial seizures, generalized tonic-clonic seizures, absence and myoclonic seizures, and status epilepticus.
69. Indicate why benzodiazepines are rarely used in the chronic therapy of seizure states but are valuable in status epilepticus.
70.Identify the distinctive toxicities of felbamate, lamotrigine, and topiramate.
71. Name the major inhalation anesthetic agents and identify their pharmacodynamic and pharmacokinetic properties.
72. Describe what is meant by the terms (1) blood:gas partition coefficient and (2) minimum alveolar
anesthetic concentration.
73. Identify proposed molecular targets for the actions of anesthetic drugs.
74. Describe how the blood:gas partition coefficient of an inhalation anesthetic influences its speed of onset of anesthesia and its recovery time.
75. Identify the commonly used intravenous anesthetics and list their main pharmacokinetic and pharmacodynamics characteristics.
76. Describe the mechanism of action of local anesthetics.
77. Know what is meant by the terms “use-dependent blockade” and “state-dependent blockade.”
78. Explain the relationship among tissue pH, drug pK, and the rate of onset of local anesthetic action.
79. List 4 factors that determine the susceptibility of nerve fibers to local anesthetic blockade.

80. Describe the major toxic effects of the local anesthetics.
81. Describe the neurochemical imbalance underlying the symptoms of Parkinson's disease.
82.Identify the mechanisms by which levodopa, dopamine receptor agonists, selegiline, tolcapone, and muscarinic blocking drugs alleviate parkinsonism.
83. Describe the therapeutic and toxic effects of the major antiparkinsonism agents.
84. Identify the compounds that inhibit dopa decarboxylase and COMT and describe their use in parkinsonism.
85. Identify the chemical agents and drugs that cause parkinsonism symptoms.
86. Identify the most important drugs used in the management of essential tremor, Huntington's disease, drug-induced dyskinesias, restless legs syndrome, and Wilson's disease.
87. Describe the "dopamine hypothesis" of schizophrenia and reasons why this hypothesis is not completely satisfactory.
88. Identify 4 receptors blocked by various antipsychotic drugs and name drugs that block each.
89. Identify the established toxicities of each of the following drugs: chlorpromazine, clozapine, haloperidol, thioridazine, ziprasidone.
90. Describe tardive dyskinesia and the neuroleptic malignant syndrome.
91. Identify the distinctive pharmacokinetic features of lithium, and list its adverse effects and toxicities.
92. List the alternative drugs used in bipolar disorder.
93. Describe the probable mechanisms of action and the major characteristics of TCAs, including receptor interactions, adverse effects (from chronic use and in overdose), drug interactions, and clinical uses.
94. Identify the drugs classified as SSRIs and SNRIs, and describe their characteristics, including clinical uses, adverse effects, and potential drug interactions.
95. Identify drugs thought to act via block of serotonin receptors, and describe their characteristics including clinical uses, adverse effects, and potential drug interactions.
96. What are the major toxicities of MAO inhibitors?
97. Identify 3 opioid receptor subtypes and describe 2 ionic mechanisms that result from their activation.
98. Name the major opioid agonists, rank them in terms of analgesic efficacy, and identify specific dynamic or kinetic characteristics.
99. Describe the cardinal signs and treatment of opioid drug overdose and of the withdrawal syndrome.
100. List acute and chronic adverse effects of opioid analgesics.
101 Identify an opioid receptor antagonist and a mixed agonist-antagonist.
102. Identify opioids used for antitussive effects and for antidiarrheal effects.
103. Identify 5 different groups of drugs used in peptic ulcer disease.
104. Describe the mechanism of action of omeprazole and related drugs.
105. List 7 different drugs used in the prevention of chemotherapy- or radiation-induced emesis and identify the receptors with which they interact.
106. Describe the mechanism of action, clinical uses, and adverse effects of metoclopramide.

107. Identify 2 drugs commonly used as antidiarrheal agents and 4 drugs with different mechanisms that are used as laxatives.
108. Identify drugs used in the management of inflammatory bowel disease and irritable bowel syndrome.
109. Describe the mechanism of antibacterial action of beta-lactam antibiotics.
110. Describe 3 mechanisms underlying the resistance of bacteria to beta-lactam antibiotics.
111. Identify the prototype drugs in each subclass of penicillins, and describe their antibacterial activity and clinical uses.
112. Identify the 4 subclasses of cephalosporins, and describe their antibacterial activities and clinical uses.
113. List the major adverse effects of the penicillins and the cephalosporins.
114. Identify the important features of aztreonam, imipenem, and meropenem.
115. Describe the clinical uses and toxicities of vancomycin.
116. Explain how these agents inhibit bacterial protein synthesis.
117. Identify the primary mechanisms of resistance to each of these drug classes.
118. Name the most important agents in each drug class, and list 3 clinical uses of each.
119. Recall distinctive pharmacokinetic features of the major drugs.
120. List the characteristic toxic effects of the major drugs in each class.
121. Describe 3 actions of aminoglycosides on protein synthesis and 2 mechanisms of resistance to this class of drugs.
122. List the major clinical applications of aminoglycosides and identify their 2 main toxicities.
123. Describe aminoglycoside pharmacokinetic characteristics with reference to their renal clearance and potential toxicity.
124. Understand time-dependent and concentration-dependent killing actions of antibiotics and what is meant by postantibiotic effect.
125. Describe how sulfonamides and trimethoprim affect bacterial folic acid synthesis and how resistance to the antifolate drugs occurs.
126. Identify major clinical uses of sulfonamides and trimethoprim, singly and in combination, and describe their characteristic pharmacokinetic properties and toxic effects.
127. Describe how fluoroquinolones inhibit nucleic acid synthesis and identify mechanisms involved in bacterial resistance to these agents.
128. List the major clinical uses of fluoroquinolones and describe their characteristic pharmacokinetic properties and toxic effects.
129. List 5 special problems associated with chemotherapy of mycobacterial infections.
130. Identify the characteristic pharmacodynamic and pharmacokinetic properties of isoniazid and rifampin.
131. List the typical adverse effects of ethambutol, pyrazinamide, and streptomycin.
132. Describe the standard protocols for drug management of latent tuberculosis, pulmonary tuberculosis, and multidrug-resistant tuberculosis.
133. Identify the drugs used in leprosy and in the prophylaxis and treatment of M avium-intracellulare complex disease.

134. Describe the mechanisms of action of the azole, polyene, and echinocandin antifungal drugs.
135. Identify the clinical uses of amphotericin B, flucytosine, individual azoles, caspofungin, griseofulvin, and terbinafine.
136. Describe the pharmacokinetics and toxicities of amphotericin B.
137. Describe the pharmacokinetics, toxicities, and drug interactions of the azoles.
138. Identify the main topical antifungal agents.
139. Identify the main targets for antiviral action in viral replication.
140. Describe the mechanisms of action of antiherpes drugs and the mechanisms of HSV and CMV resistance.
141. List the main pharmacokinetic properties and toxic effects of acyclovir, ganciclovir, cidofovir, and foscarnet.
142. Describe the mechanisms of anti-HIV action of zidovudine, indinavir, and enfuvirtide.
143. Match a specific antiretroviral drug with each of the following: to be avoided in pregnancy; hyperpigmentation; neutropenia; pancreatitis; peripheral neuropathy; inhibition of P450; severe hypersensitivity reaction; injection site reactions.
144. Identify the significant properties of 4 drugs active against HBV and HCV.
145. Identify the significant properties of an anti-influenza drug acting at the stage of viral uncoating and another acting at the stage of viral release.
146. Identify the clinical uses of metronidazole and describe its pharmacokinetics and toxicities.
147. List the clinical uses of mupirocin and polymyxins.
148. Identify the major urinary antiseptics and their characteristic adverse effects.
149. List the agents used as antiseptics and disinfectants and point out their limitations.