CO01: Describe the normal and patho-physiology of system(s) to which discussed drugs are targeted
CO01.001: Describe drug-receptor interactions and their characteristics
CO01.002: Define the lock and key model and the induced-fit model for drug-receptor interaction
CO01.003: Define xenobiotics, hormones, neurotransmitters, agonist, inverse agonist, partial agonist, antagonist, (competitive and non-competitive) and spare receptors
CO01.004: Identify a drug-dose response curve and the effects of agonists and antagonists on dose-response curves
CO01.005: Identify maximal response and EC50 values in a dose-response plot
CO01.006: Describe how to compare relative potency and relative efficacy of drugs
CO01.007: Define affinity, intrinsic activity, efficacy and potency
CO01.008: Define drug therapeutic index
CO01.009: Classify the different types of receptors and their properties: Ligand-gated ion channels, G-protein coupled receptors, Receptors as enzymes, Nuclear receptors
CO01.010: Define second messenger systems and the mediators of these systems: The G-protein coupled, The adenylate cyclase system, The phosphatidylinositol phosphate signaling system, The protein kinase signaling system
CO01.011: Describe CYP450 locations and functions
CO01.012: Classify the CYP450 families and subfamilies (isoforms)
CO01.013: Define CYP50 induction and inhibition
CO01.014: Identify the differences between active and inactive metabolites
CO01.015: Define pro-drug
CO01.016: Describe physiological and genomic factors that may affect CYP450s enzymatic
CO01.017: Describe how drugs can interact with the CYP450 and affect other drugs' metabolism
CO01.018: List drugs that inhibit or induce the major CYP450 isoforms
CO01.019: Describe the clinical relevance of drug metabolism and interactions
CO01.020: Describe the anatomical, neurochemical, and physiological characteristics of the autonomic nervous system.
CO01.021: Explain the principles of neurotransmitter synthesis, release and degradation
CO01.022: Differentiate between the autonomic nervous system and the somatic nervous system
CO01.023: Differentiate between the sympathetic and parasympathetic nervous system
CO01.024: Describe the physiological effects of both sympathetic and parasympathetic nervous system activation and inhibition on the organs that they innervate
CO01.025: Describe the various receptor families and subtypes that mediate activation of the parasympathetic nervous system.
CO01.026: Describe the subtypes of cholinesterase enzymes and the mechanisms by which acetylcholine is hydrolyzed
CO01.027: Describe the physiological actions of prototypical cholinergic agonists/antagonists on various organ systems
CO01.028: Explain the therapeutic value and the therapeutic applications for an individual agent based on its pharmacological classification
CO01.029: Explain the major drug interactions of the cholinergic agonists/antagonists
CO01.030: Describe the side effects of cholinergic agonists/antagonists
CO01.031: Describe the classic symptoms of mushroom poisoning
CO01.032: Describe the side effects and toxic effects of acetylcholinesterase inhibitors
CO01.033: State and describe the treatments for acetylcholinesterase inhibitor toxicities and sympathetic nervous system
CO01.034: Describe the effects of sympathetic and of renin-angiotensin-aldosterone (RAA) stimulation and inhibition on blood pressure
CO01.035: Explain the concept of preload and afterload
CO01.036: State the concept of endothelium-dependent and endothelium-independent vasodilators
CO01.037: Describe the role of nitric oxide and of prostacyclin on blood vessel function
CO01.038: List the endogenous substances with vasodilating and vasoconstricting actions on blood vessels

CO01.039: Explain the effects of phosphodiesterase V inhibitors on blood vessels and nitric oxide

CO01.040: State the second messengers involved on the vasodilator and vasoconstrictor action of drugs and endogenous substances

CO01.041: Describe the role of renin-angiotensin-aldosterone (RAA) system on blood pressure control

CO01.042: Describe the mechanism by which the RAA drugs lower the blood pressure

CO01.043: Explain the similarities and differences between ACEI, ARB, Renin inhibitor and aldosterone antagonists on blood pressure, angiotensin II and bradykinin levels

CO01.044: Define the preventable and non-preventable risk factors that may lead to IHD

CO01.045: Discuss the possible clinical presentations of IHD

CO01.046: Describe the use of beta blockers, organic nitrates and CCBs to treat effort-induced angina, and Prinzmetal's angina, their mechanism of action, side effects, indications and contraindications

CO01.047: Explain ischemic heart disease (IHD) and its consequences if untreated

CO01.048: Define the preventable and non-preventable risk factors that may lead to IHD

CO01.049: Discuss the possible clinical presentations of IHD

CO01.050: Describe the major ions involved in the generation of pacemaker and non-pacemaker action potentials

CO01.051: Describe the groups of drugs used to treat arrhythmias, their mechanism of action, side effects, indications and contraindications

CO01.052: Explain atrial fibrillation and the drugs used for rate and rhythm control

CO01.053: Explain the metabolism of lipids including the role of the different apoproteins and lipoproteins

CO01.054: Define predisposing factors for dyslipidemias

CO01.055: Classify lipid disorders

CO01.056: List the recommendations for lipid levels in patients with different cardiovascular risk factors

CO01.057: Describe non-pharmacological life style interventions in patients with dyslipidemia

CO01.058: Describe the cardiovascular risk associated with dyslipidemia

CO01.059: Describe the atherosclerosis process and the mediators involved

CO01.060: Describe the mechanisms of coagulation and platelet interactions in thrombogenesis

CO01.061: List the therapeutic targets of antithrombotic medications and their indications

CO01.062: Classify the specific antithrombotic agents by their mechanisms of action

CO01.063: Differentiate between a "psychosis" and a "neurosis"

CO01.064: Describe schizophrenia in terms of characteristic symptoms, genetics, and good or poor prognosis

CO01.065: Classify a symptom as either a positive" or "negative" symptom of schizophrenia

CO01.066: List the major dopaminergic pathways in the CNS and the processes they are believed to mediate

CO01.067: Define "hypofrontality" as it applies to schizophrenia

CO01.068: Outline the postulate pathophysiology of schizophrenia particularly with respect to dopaminergic, serotonergic, and glutaminergic neural systems

CO01.069: Describe the proposed pathologies of positive vs. negative symptoms of schizophrenia

CO01.070: Discuss evidence for/against the "biogenic amine", "receptor sensitivity" and "serotonin" hypotheses of depression

CO01.071: Recognize the various disease states that have depression as a component, and state appropriate therapeutic measures for the disease state

CO01.072: List and recognize the four cardinal symptoms of PD

CO01.073: Review some of the potential causes of PD
CO01.074: Identify the structures comprising the "basal ganglia" and define the "extrapyramidal motor system"
CO01.075: Describe the "wiring" of the basal ganglia, thalamus, and motor cortex and identify how dopamine and acetylcholine modify neurotransmission within key circuits connecting these structures
CO01.076: Explain the concept of dopamine vs. acetylcholine "balance" in regulating movement
CO01.077: State the primary deficit which leads to PD
CO01.078: Describe the synthesis and metabolism of dopamine, including key enzymes and their locations in the periphery and CNS
CO01.079: Name and describe the clinical characteristics of the various anxiety disorders
CO01.080: Describe key features of NREM and REM
CO01.081: State the major differences between the sleep pattern of the young adult versus that of the elderly
CO01.082: Outline sleep hygiene measures
CO01.083: Define "sleep latency"
CO01.084: Compare the effects of the various chemical classes of hypnotic agents on REM and NREM sleep
CO01.085: Classify the individual hypnotic agents as either "long-" "intermediate-" or "short" -acting
CO01.086: Choose an appropriate agent to treat asleep disorder based on the onset of action and duration of action of the agent
CO01.087: Describe the physiology of melatonin release
CO01.088: Define epilepsy
CO01.089: State the difference between an "seizure" and a "convulsion"
CO01.090: Outline potential causes or triggers of seizures
CO01.091: Discuss the various animal models of epilepsy, and the ability of a model to predict an agent's efficacy in treating a particular seizure type
CO01.092: Identify and be able to provide a detailed description of the clinical features of the various seizure types that comprise epilepsy
CO01.093: Identify the signaling molecules that regulate the release of thyroid hormones
CO01.094: List the steps in the synthesis and release of thyroid hormones
CO01.095: Describe key physiological effects of thyroid hormones
CO01.096: Outline the body systems manifestations of hypo-and hyper-thyroidism
CO01.097: Name and discuss the various disease states presenting with hypo- or hyper-thyroidism
CO01.098: Discuss the physiological regulation of the release of cortisol and other adrenal steroids from the adrenal gland
CO01.099: Discuss the key physiological actions of cortisol
CO01.100: Outline the synthetic pathways of the various steroids of the human body
CO01.101: Describe the mechanism of activation, and the workings of the glucocorticoid receptor
CO01.102: Name the various disease states associated with either an excess or deficiency of cortisol or aldosterone, and their clinical presentation
CO01.103: Describe the physiological events of the follicular and luteal phases of the human menstrual cycle
CO01.104: Describe the action of estrogen vs. progesterone on the endometrial lining
CO01.105: Describe key physiological actions of estradiol and progesterone
CO01.106: List the important hormones produced by the pancreas, including the specific cell-types where they are formed
CO01.107: List important enhancers and inhibitors of insulin release from the pancreas
CO01.108: Describe the insulin receptor, its activation and operation, and the important signaling systems to which it is linked
CO01.109: Describe the sequence of events which allows the beta-cell to release insulin in the presence of glucose
CO01.110: Describe the various physiological effects of insulin on the liver, skeletal muscle and adipose tissue especially with respect to carbohydrate, lipid, and protein metabolism
CO01.111: Describe the biochemical process which lead to ketone body formation and ketoacidosis
CO01.112: Differentiate between Type 1 and Type 2 diabetes mellitus and compare and contrast the clinical characteristics of both
CO01.113: Identify important long-term complications of diabetes mellitus with particular emphasis on neuropathies and microvascular disease
CO01.114: Explain how the aldose reductase pathway participates in pathological processes associated with long-term diabetes mellitus
CO01.115: Describe the basic mechanisms of the inflammatory process
CO01.116: Recall the natural flow of events involved in the arachidonic cascades
CO01.117: List the major prostaglandins and their therapeutic roles
CO01.118: Discuss the use of the major prostaglandins
CO01.119: Describe the pharmacodynamics of drugs used for osteoarthritis
CO01.120: Outline the synthesis and metabolism of serotonin
CO01.121: Review important physiological receptors for serotonin, the processes that they mediate, and the messenger systems to which they are coupled
CO01.122: Describe the components of the "trigeminovascular" theory of migraine headache
CO01.123: Recognize the "ergot" nucleus
CO01.124: Identify receptor sites for individual ergots, and state whether the ergot acts as an agonist, partial agonist or antagonist at the receptor
CO01.125: Recall the pathophysiology of pain
CO01.126: Describe the endogenous opiate system
CO01.127: Recall the various opiate receptors

CO02: Identify generic and trade names of discussed drugs; and familiarize themselves with marketed
CO02.01: List the name of the most common diuretics used in patients with hypertension
CO02.02: List the drugs that interfere with the RAA system
CO02.03: List the drugs that block voltage-dependent calcium channels (calcium channel blockers, CCB)
CO02.04: List the antihypertensive drugs that activate potassium-channels.
CO02.05: Describe the effects on blood pressure, afterload and preload of drugs that activate the potassium-channels.
CO02.06: Describe their clinical indications and side effect profile of drugs that activate the potassium-channels.
CO02.07: List most commonly used antihypertensive medications for intravenous use. Describe their mechanisms of action, side effects, indications and contraindications.
CO02.08: List the anti-arrhythmic drugs with class III activity
CO02.09: Outline common mechanisms of action of the antiepileptic drugs
CO02.10: List drugs of choice and alternative agents for treating a particular seizure type
CO02.11: Compare and contrast the various thyroid hormone preparations used for replacement therapy
CO02.12: Describe the various drug and non-drug treatments available for the treatment of hyperthyroidism
CO02.13: List the various antiglucocorticoids that are available and their clinical uses
CO02.14: Discuss the clinical uses of the marketed glucocorticoids, their dosing regimens, and available formulations
CO02.15: Identify commercially-available analogs/formulations of GnRH, LH, and FSH and their clinical uses
CO02.16: Classify the various commercially-available formulations with estrogen-line activity and identify common clinical uses of these agents
CO02.17: Identify the various pharmaceutical preparations of insulin, how they are formulated, their onset and duration of actions, and side effects of insulin therapy
CO02.18: For the drugs used to treat Type II diabetes students should be able to
CO02.19: Identify generic and trade names of discussed drugs used to treat Type II Diabetes.
CO02.20: Identify the marketed dosage forms of the drugs used to treat Type II Diabetes.
CO02.21: Describe the mechanism of action of the drugs used to treat Type II Diabetes.
CO02.22: List important side effects of the drug used to treat Type II Diabetes
CO02.23: Cite relevant pharmacokinetic properties of the discussed drugs used to treat Type II Diabetes.
CO02.24: Identify the clinical role of discussed drugs used to treat Type II Diabetes.

CO02.25: Compare and contrast the individual "triptans" with regard to onset and duration of action, and available formulation
CO02.26: State whether the agent is used orally or parenterally (or both)

CO03: Describe the mechanism of action of discussed drugs, including their specific receptor interactions,
CO03.01: Describe the major chemical classes of cholinergic agonists/antagonists and the effect of structure on drug pharmacokinetics.
CO03.02: Draw the chemical structure of Norepinephrine and Epinephrine
CO03.03: Differentiate between receptor activation on organ function.
CO03.04: Explain the principles of reflex bradycardia
CO03.05: Discuss the pharmacological and therapeutic rational for the use of Norepinephrine, Epinephrine, and Dopamine
CO03.06: Describe the mechanisms of action for the various adrenergic agonists/antagonists
CO03.07: Differentiate the physiological effects of the various drug classes
CO03.08: Discuss the therapeutic value and the therapeutic applications for an individual agent based on its pharmacological classification
CO03.09: List the drugs that modulate the activity and effects of the sympathetic nervous system, and their major clinical uses
CO03.10: Explain the cardiovascular and non-cardiovascular effects obtained when blocking alpha1, beta1 and/or beta2 receptors
CO03.11: Explain receptor selectivity and clinical advantages and disadvantages of using drugs with and without receptor selectivity
CO03.12: Discuss the use of diuretics in patients with gout
CO03.13: Describe the factors that may make a patient resistant to diuretics
CO03.14: Discuss the mechanisms of action, indications, side effects and drug interactions of the different lipid lowering drugs
CO03.15: Classify lipid lowering drugs based on their efficacy and potency to manage blood lipid levels
CO03.16: Describe the structure-activity relationship of the phenothiazines including specific receptors that they antagonize and, as a consequence, their side effect profiles
CO03.17: Describe the pharmacological profiles that distinguish a "typical" antipsychotic agent from an "atypical" one
CO03.18: State how each class of clinically-useful antidepressant specifically affects serotonergic neurotransmission
CO03.19: Compare the 2 degree and 3 degree TCAs with regard to reuptake selectivity, receptor interactions, and pharmacological profile
CO03.20: Discuss the pharmacological profiles of clomipramine and fluvoxamine and cite their use in the treatment of OCD
CO03.21: Describe the pharmacological actions of the benzodiazepine anxiolytics including their side effects
CO03.22: Discuss the role of locus coeruleus in the genesis of anxiety
CO03.23: Compare the benzodiazepine anxiolytics to buspirone in terms of mechanism of action, clinical uses, onset of action and side effect profiles
CO03.24: Discuss the subunit composition of the chloride ionophore complex
CO03.25: Describe in detail the workings of the chloride ionophore complex and identify the actions of each of the following at the complex: GABA, BDZ agonists, BDZ antagonist, BZD inverse agonist, barbiturates, and picrotoxinin
CO03.26: Describe the workings of the estrogen receptor in terms of agonists, partial agonists, antagonists and SERMs
CO03.27: Differentiate between a C-21 vs. C-19 progestin and state the physiological attributes of both
CO03.28: Discuss the various therapeutic agents that modify or antagonize female gonadal hormone actions in terms of their mechanism of action, adverse effects, and clinical uses
CO03.29: Describe the mechanism of action of oral contraceptives and the various regimens/formulations that are commercially-available
CO03.30: Describe the mechanism of action of the drug
CO03.31: Describe the mechanisms of action of the major NSAIDs
CO03.32: List the therapeutic targets of NSAIDs and their indications
CO03.33: Discuss the therapeutic value and the therapeutic applications for an individual agent based on pharmacological classification
CO03.34: Describe the rational and mechanism of action of drugs used to treat osteoarthritis
CO03.35: Describe the mechanism(s) of action of the "triptan" anti-migraine agents, their adverse effects, and their contraindications
CO03.36: Describe the pharmacological effects of the opiates
CO03.37: Describe the use of opiates to treat pain
CO03.38: Describe the use of opiates in the treatment of other conditions
CO03.39: Discuss the criteria for the selection of particular opioid compounds in pain treatment
CO03.40: List the agents used to ameliorate opioid addiction
CO03.41: State the mechanism of action of anti-infective agents
CO03.42: Describe the general spectrum of anti-infective agents
CO03.43: Cite special coverages (e.g., when the anti-infective agent is a drug of choice for a particular microorganism)

CO04: Identify organ system effects of the discussed drugs
CO04.01: Describe the effects of centrally acting alpha2 agonists on blood pressure and the sympathetic system
CO04.02: State how are diuretics classified based on their renal site of action and their effects on serum and urinary electrolytes
CO04.03: Explain the mechanism of the reno-protective actions of RAA inhibitors in diabetic patients
CO04.04: Discuss the role of calcium and of voltage-dependent calcium channels on the heart and on the vascular smooth muscle
CO04.05: Explain the differences in the cardiovascular effects of dihydro-pyridines (DHP) and non-DHP CCB
CO04.06: Discuss the cardioprotective action of beta blockers

CO05: Recognize idiosyncratic and pharmacologically-based sided effects of discussed drugs
CO05.01: Explain how receptor selectivity influences the side effect profile.
CO05.02: Describe the drug interactions associated with each drug.
CO05.03: List the side effect profile of drugs that interfere with the sympathetic system.
CO05.04: List the predisposing factors associated with the toxicity of lipid lowering drugs.
CO05.05: List the common actions/side effects of the "typical" antipsychotic agents.
CO05.06: List and describe the clinical presentation(s) of the various extra pyramidal syndromes associated with antipsychotic use, and cite treatments for each syndrome and for the individual typical antipsychotic agents.
CO05.07: Describe the pharmacological profile of the barbiturates, with particular emphasis on toxicities, tolerance and dependence, and potential for drug interactions.
CO05.08: Define the "neurogenic", "chemical", and "hypoxic" respiratory drives.
CO05.09: Match specific clinical uses of the barbiturates to the duration of action of individual agents.
CO05.10: Define "cross-tolerance" as it applies to CNS depressants and identify its significance in drug withdrawal.
CO05.11: Identify those CNS depressants that are cross-tolerant and those that are not.
CO05.12: Cite adverse effects of gluco-corticosteroid use
CO05.13: Describe adverse effects of estrogen and progestin products.
CO05.14: Recognize common side effects of the oral contraceptives, and where possible, indicate if they are attributable to the estrogen vs. progestin component of the oral contraceptive.
CO05.15: Cite severe adverse effects associated with oral contraceptive use, and evaluate the risks involved with oral contraceptive use.
CO05.16: List important side effects of the drug.
CO05.17: Explain the side effects of the specific NSAID.
CO05.18: Discuss and describe the treatment of toxicities associated with the selected NSAIDs.
CO05.19: Describe the side effects associated with the use of opioid analgesics.
CO05.20: Describe the adverse effects of the anti-infective agent.

CO06: Cite relevant pharmacokinetic properties of the discussed drugs where appropriate
CO06.01: Describe the major classes of drugs and the effect of structure on drug pharmacokinetics.
CO06.02: Discuss the role of genetic polymorphism in limiting the efficacy of certain antithrombotic drugs.
CO06.03: Cite the advantages and disadvantages of L-dopa vs. direct-acting dopamine agonists in the treatment PD.
CO06.04: Describe the mechanisms by which L-dopa therapy may be neurotoxic vs. potential neuroprotective effects of MAO-B inhibitors.
CO06.05: State the reason why zolpidem, zaleplon, and eszopiclone are selective hypnotics while BDZa are not.
CO06.06: Describe in detail the metabolism of the BZDs. and triazolo-BZDs including active metabolites, and relate this to the durations of actions of individual agents.
CO06.07: Cite relevant pharmacokinetic properties of the discussed drugs where appropriate.
CO06.08: Describe the advantages and disadvantages to using specific opioid drugs.
CO06.09: Discuss opioid dependence and the effects of opioid withdrawal.
CO06.10: State whether the agent undergoes renal or biliary elimination (or both).
CO06.11: Discuss the mechanisms of resistance to the anti-infective agent.

CO07: Identify the clinical role of discussed drugs in therapy
CO07.01: Discuss the role of the pharmacist when dispensing antihypertensive drugs, including treatment discontinuation.
CO07.02: Discuss the role of the pharmacist in preventing adverse side effects of antihypertensive medications.
CO07.03: Explain life-style modifications in hypertension control.
CO07.04: List the clinical indications for diuretic use, other than hypertension.
CO07.05: List the patient monitoring parameters of lipid lowering drugs.
CO07.06: Compare pharmacological profiles of the TCAs vs. SSRIs with regard to side effects and major toxicities.
CO07.07: Recognize the symptoms of "the serotonin syndrome".
CO07.08: Regarding the individual atypical antipsychotic agents, students should refer to the Course Objectives listed on page 2 of the syllabus.
CO07.09: Discuss the side effect profiles of the MAOIs, phenelzine and tranylcypromine.
CO07.10: Discuss the underpinnings of the so-called "cheese effect" associated with MAOI use and list several dietary restrictions.
CO07.11: Discuss the uses and side effects of flumazenil.
CO07.12: Describe the pharmacological mechanisms by which barbiturates are more "generalized" depressants than BDZs.
CO07.13: Identify the clinical role of discussed drugs in therapy.
CO07.14: Cite the therapeutic uses of then anti-infective agent.

CO08: Identify potential and known drug interactions
    CO08.01: Discuss counseling patients treated with organic nitrates, with especial attention to issues related to drug tolerance and dependence.
    CO08.02: Discuss the interaction between phosphodiesterase V inhibitors and organic nitrates, and nitric oxide-generating beta blockers.
    CO08.03: Discuss anti-arrhythmic and non-anti-arrhythmic drugs that prolong the QT and their possible adverse effects.
    CO08.04: Explain how to counsel a patient receiving two or more drugs that prolong the QT interval.
    CO08.05: Describe the clinical significant drug interactions in patients receiving amiodarone.
    CO08.06: Discuss the therapeutic values and the therapeutic applications for an individual agent based on its pharmacological classification.
    CO08.07: Explain the side effects of the specific antithrombotic drugs.
    CO08.08: Describe the drug interactions of the specific antithrombotic drugs.
    CO08.09: Discuss and describe the treatment of toxicities associate with the various anti-thrombotic agents.
    CO08.10: Identify potential drug interactions when utilizing more than one agent to treat epilepsy.
    CO08.11: Describe the drug interactions of the specific NSAID.
    CO08.12: Discuss the drug interactions associated with the anti-infective agent, if any.

CO09: Cite contraindications associated with the use of a drug
    CO09.01: List the compelling indications and the contraindications for the clinical use of beta blockers.
    CO09.02: Describe the side effects most commonly associated with each of the classes of diuretics.
    CO09.03: Discuss the risks associated with decrease and increase in serum potassium.
    CO09.04: List the indications, contraindications, and the side effect profile of drugs that interfere with the RAA.
    CO09.05: List the clinical indications and contraindications for the use of CCB.
    CO09.06: List therapeutic agents that are contraindicated when being treated with an MAOI.
    CO09.07: Cite the contradictions to the use of the anti-infective agent, if any.