

# Course Lecture Schedule

		<b>ALEKS Access</b>	<b>ALEKS Syllabus</b>
L1 T 1/12		<b>Lecture 1. General Chemistry Review</b>  Lewis Structures, Molecular Geometry, Arrhenius Equation, Second Law  Text: Lewis Structures; Molecular Geometry; Chemical Kinetics; Acids & Bases, Chemical Thermodynamics  Handout: <a href="#">Lewis Structure Methodology</a>  Wiki: <a href="#">Hybridization</a> ; <a href="#">Aromaticity</a> ; <a href="#">Arrhenius Equation</a> ; <a href="#">Second Law of Thermodynamics</a>	
L2 R 1/14	<u>PS 1 Due</u>	<b>Lecture 2. Intermolecular Forces (Noncovalent Interactions)</b>  Coulomb's Law, Electronegativity, Hydrogen Bonds, Van der Waals Forces, Dipole-Dipole & Ion-Dipole Interactions, Solvation, Hydrophobicity  Wiki: <a href="#">Electronegativity</a> ; <a href="#">Intermolecular Forces</a> ; <a href="#">London Dispersion Forces</a> ; <a href="#">Hydrogen Bonds</a> ; <a href="#">Coulomb's Law</a> ; <a href="#">Solvation</a> ; <a href="#">Hydrophobicity</a>  Text: Electronegativity, Intermolecular Forces (Hydrogen Bonding, Van Der Waals Forces, Dipole-Dipole & Ion-Dipole Interactions)	
L3 T 1/19	<u>PS2 Due</u>	<b>Lecture 3. Solubility and Lipids</b>  Thermodynamics of Liquid-Liquid Solubility, Octanol-Water Distribution Equilibrium Constants [Partition Coefficients (P)], Phospholipid Components and Structure, Cell Membrane Structure and Properties  Wiki: <a href="#">Partition Coefficient</a>  Link: <a href="#">UCSF Membrane Tutorial</a> (Great resource!!)  Reading: <a href="#">The Components and Properties of Cell Membranes</a>  Link: <a href="#">Kimball's Biology Pages: Fats</a> (Unsaturated Fats, Trans and Omega Fatty Acids, <a href="#">Phospholipids</a> )	
L4 R 1/21	<u>PS3 Due</u>	<b>Lecture 4. Condensation and Hydrolysis Reactions</b>  Alcohols and Carboxylic Acids, Triglyceride Formation, Polyphosphate and Phospholipid Formation  Handout: Condensation Reactions	
L5 T 1/26	<u>PS4 Due</u>	<b>Lecture 5. Amino Acids</b>  Structure, Chirality, Side Chain Polarity, Peptide Bond, Peptide Condensation and Hydrolysis, Henderson-Hasselbalch Equation, Charge and pH, Solubility and pH  Wiki: <a href="#">Amino Acids</a> ; <a href="#">Chirality</a> ; <a href="#">Peptide Bond</a> ; <a href="#">Henderson-Hasselbalch Equation</a>  Link: <a href="#">Amino Acid Structures at pH=7.4</a> <a href="#">Amino Acid Chart with pKa Table</a>	
L6 R 1/28	<u>PS5 Due</u>	<b>Lecture 6. Protein Structure</b>  Primary Structure, Disulfide Bonds, Secondary Structure - Alpha Helices and Beta Sheets, Tertiary/Quaternary Structures and Associated Noncovalent Interactions, Prions, PostTranslational Protein Modifications  Wiki: <a href="#">Protein Structure</a> <a href="#">Disulfide Bonds</a>  Kimball's Biology Pages: <a href="#">Proteins</a> ; <a href="#">Polypeptides</a> ;  Kimball's Biology Pages: Protein Structure: <a href="#">Primary</a> ; <a href="#">Secondary</a> ; <a href="#">Tertiary</a> ; <a href="#">Quaternary</a>	
L7 T 2/2	<u>Quiz 4</u>	<b>Lecture 7. Chemical Kinetics</b>  McQuarrie Text Chapters 17 and 18	
L8 R 2/4	<u>PS6 Due</u>	<b>Lecture 8. Enzymes: Structure and Function</b>  Enzyme Catalysis, Mechanism of Action, Active Site, Substrate Binding, Catalytic Roles, Michaelis-Menton Kinetics, Lineweaver-Burk Plots, Km and Vmax Determination, Turnover Numbers, Km and Substrate-Enzyme Affinity  Text: Michaelis-Menton Model of Enzyme-Catalyzed Reactions  Kimball's Biology Pages: <a href="#">Enzymes</a>  Kimball's Biology Pages: <a href="#">Enzyme Kinetics</a>	
L9 T 2/9		<b>Lecture 9. Enzymes as Drug Targets</b>	

PS7 Due

Active Site Inhibitors, Allosteric Inhibition, Competitive / Non-Competitive Inhibitors, Suicidal Substrates

Wiki: [Enzymes](#); [Enzyme Inhibitors](#)

### Lecture 10. Medical Approaches to Inflammation I

Cyclooxygenase Case Study

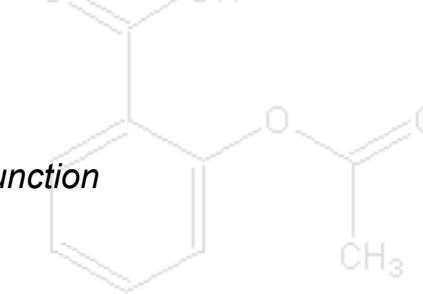
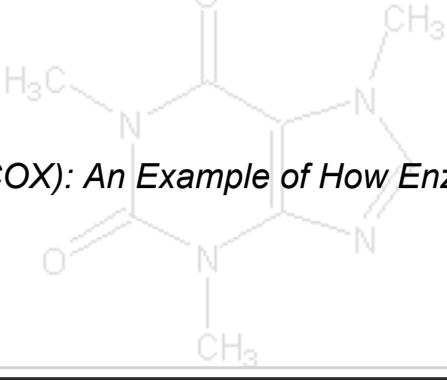
Reading: Protein Function – Section III Cyclooxygenase (COX): An Example of How Enzymes Function

Wiki: [NSAIDs](#); [COX-2 Inhibitors](#)

Reading: Molecular Basis of Inflammation

L10 R 2/11

Quiz 5



C1 R 2/16

### Compensatory Time for [Review Paper Preparation](#)

### Lecture 11. Medical Approaches to Inflammation II

Steroids - Structure, Intracellular Receptors, Anti-Inflammatory MOA

Reading: Molecular Basis of Inflammation

Reading: Protein Function – Section II Nuclear Receptors: An Example of How Proteins Function

Reading: Kimball's Biology Pages: [Steroid Hormone Receptors and their Response Elements](#)

Wiki: [Steroid](#) ; [Zinc Finger](#); [Complex Ion](#) ; [d-Orbitals](#)

### Lecture 12. Receptors as Drug Targets I

Neurotransmitters & Hormones, Agonists, Antagonists, Partial Agonists, Inverse Agonists,

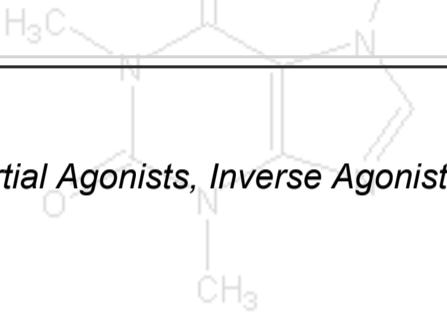
Treatment of Hormone-Dependent Breast Cancers

Wiki: [Neurotransmitters](#); [Hormones](#); [Receptors](#); [Antagonists](#); [Agonists](#); [Partial Agonists](#); [Inverse Agonists](#);

[Ligands](#); [Tamoxifen](#); [Aromatase Inhibitors](#);

L12 T 2/23

Quiz 6



### Lecture 13. Receptors as Drug Targets II

Desensitization & Sensitization; Tolerance & Dependence; Receptor Types & Subtypes; Affinity, Efficacy, & Potency; Ligand-Receptor Dissociation Equilibria, EC50, IC 50

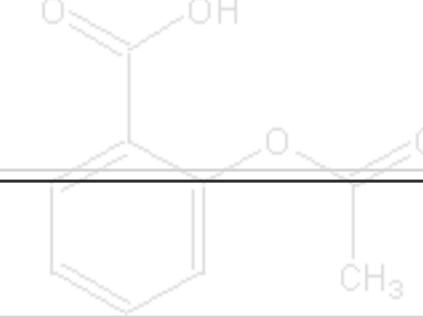
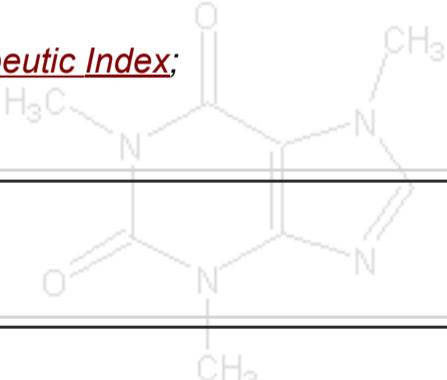
Wiki: [Efficacy](#); [Dose-Response Curve](#); [EC50](#); [IC50](#); [Therapeutic Index](#);

Scribd: [Sensitization and Desensitization](#);

L13 R 2/25

### T1 T 3/1 Midterm

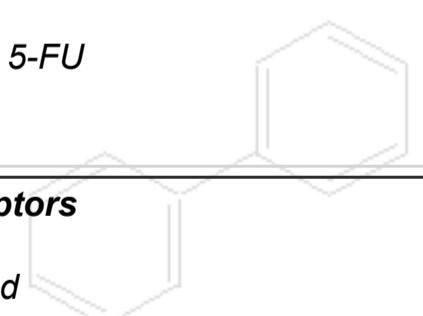
[A Few Practice Problems](#)....



### Lecture 14. Nucleic Acids as Drug Targets

Structure of DNA, Central Dogma, Intercalating Drugs, Alkylating & Metallating Agents, Cisplatin, 5-FU

Wiki: [Alkylating Agents](#); [Sulfur Mustard](#); [Cisplatin](#);



L14 R 3/3

### L15 R 3/8

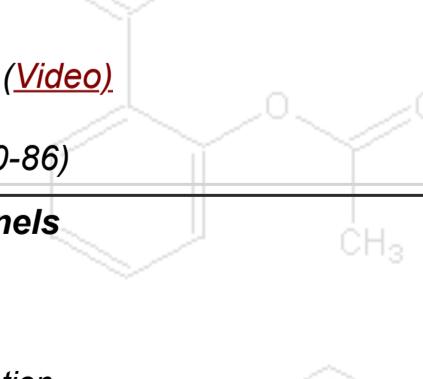
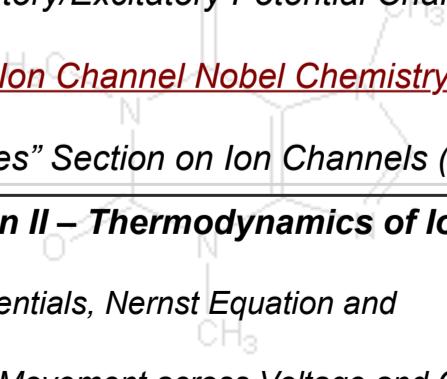
Ion Concentration Gradients, Ion Channel Structure and Mechanisms of Action, Ligand-Gated and

Voltage-Gated Ion Channels, Cell Membrane Potentials, Nernst Equation and Membrane

Equilibrium Potentials, Ion Movements and Resulting Inhibitory/Excitatory Potential Changes,

Wiki: [Ion Channels](#); [Nernst Equation](#); [Action Potential](#) ; [K+ Ion Channel Nobel Chemistry Lecture \(Video\)](#)

UCSF Reading: "Diffusion and Transport Across Membranes" Section on Ion Channels (pages 80-86)



### Lecture 16. Receptor Structure and Signal Transduction II – Thermodynamics of Ion Channels

Sodium-Potassium-ATP Pump Mechanism, Cell Membrane Potentials, Nernst Equation and

Membrane Equilibrium Potentials, Free Energy Changes of Ion Movement across Voltage and Concentration

Gradients, Ion Movements and Resulting Inhibitory/Excitatory Potential Changes

L16 T 3/10

PS9 Due

UCSF Reading: "Diffusion and Transport Across Membranes" Section on ATP-Driven Ion Pumps (pages 73-77)

Wiki: [Neuron; Membrane Potential; Na<sup>+</sup>/K<sup>+</sup>-ATPase](#)

McGraw-Hill: [Sodium-Potassium-ATP Pump](#)

**L18 R 3/22 Lecture 17. Receptor Structure and Signal Transduction III – G-Protein Coupled Receptors (GPCRs)**

G-Protein Coupled Receptor Structure, Evolutionary Tree of GPCRs, GPCR Signaling Mechanism of Action

[2012 Nobel Chemistry - Nobel Lecture Rob Lefkowitz](#) [Nobel Lecture Brian Kobilka](#)

Wiki: [G-Protein Coupled Receptors \(GPCRs\);](#)

**L18 R 3/24 Lecture 18. Cholinergics**

Nervous System, Cholinergic System, Acetylcholine Structure & Receptor Binding, Cholinergic Antagonists, Acetylcholinesterase Inhibitors

**L19 T 3/29 Lecture 19. Adrenergics**

Geometry of Adrenergic Receptors, Main Types of Norepinephrine Receptors, Interaction of Adrenergic Receptors with Neurotransmitters, MOA of Activated Receptors

**L20 R 3/31 Lecture 20. Psychoactive Drugs I: Stimulants and Tranquilizers**

Handout:

**L21 T 4/5 Lecture 21. Psychoactive Drugs II: Anti-Depressants**

Handout:

**L22 R 4/7 Lecture 22. Psychoactive Drugs III: Anti-Psychotics and Hallucinogens**

Handout

**L23 T 4/12 Lecture 23. Psychoactive Drugs IV: Cannabinoids, Opium & Opioid Analgesics**

Cannabinoids, Source and History of Opiates, Structure of Opioids and Opioid Receptors,

Endogenous Opioids, Side Effects of Opiates

Text Assignment: MedChem – Chapter 21

**L24 R 4/14 Lecture 24. Chemistry of Local & General Anesthetics**

MOA for Local Anesthetics, pKa Relevance, History of Cocaine Use by Humans, MOA for General Anesthetics, Molecular Structures of Widely Used General Anesthetics

Handout: Local and General Anesthetics

**T2 T 4/19 Test 2 Concepts**

**R1 R 4/21 Review**

Paper Due