Course Lecture Schedule

L1 T 1/8	***Lecture 1. General Chemistry Review*** *Lewis Structures, Molecular Geometry, Arrhenius Equation, Second Law* *Text: Lewis Structures; Molecular Geometry; Chemical Kinetics; Acids & Bases, Chemical Thermodynamics* *Handout: Lewis Structure Methodology* *Wiki: Hybridization; Aromaticity; Arrhenius Equation; Second Law of Thermodynamics*
L2 R 1/10 PS 1 Due	***Lecture 2. Intermolecular Forces (Noncovalent Interactions)*** *(Brown Box 3.3 - Types of Chemical Bonds)* *Coulomb's Law, Electronegativity, Hydrogen Bonds, Van der Waals Forces, Dipole-Dipole & Ion-Dipole Interactions, Solvation, Hydrophobicity* *Wiki: : Electronegativity; Intermolecular Forces; London Dispersion Forces; Hydrogen Bonds; Coulomb's Law; Solvation; Hydrophobicity* *Text: Electronegativity, Intermolecular Forces (Hydrogen Bonding, Van Der Waals Forces, Dipole-Dipole & Ion-Dipole Interactions*
L3 T 1/15 PS2 Due	***Lecture 3. Solubility and Lipids*** *(Brown 5.1.1, 5.2.1 - Fatty Acids and Derivatives, Membrane Structure)* *Thermodynamics of Liquid-Liquid Solubility, Octanol-Water Distribution Equilibrium Constants [Partition Coefficients (P)], Phospholipid Components and Structure, Cell Membrane Structure and Properties* *Wiki: Partition Coefficient;* *Link: UCSF Membrane Tutorial (Great resource!!)* *Reading: The Components and Properties of Cell Membranes* *Link: Kimball's Biology Pages: Fats (Unsaturated Fats, Trans and Omega Fatty Acids, Phospholipids*
L4 R 1/17 PS3 Due Quiz 1	***Lecture 4. Condensation and Hydrolysis Reactions*** *Alcohols and Carboxylic Acids, Triglyceride Formation, Polyphosphate and Phospholipid Formation* *Handout: Condensation Reactions*
L5 T 1/22 PS4 Due Quiz 2	***Lecture 5. Amino Acids*** *(Brrown 3.1 - Amino Acids)* *Structure, Chirality, Side Chain Polarity, Peptide Bond,Peptide Condensation and Hydrolysis, Henderson-Hasselbalch Equation, Charge and pH, Solubility and pH* *Wiki: Amino Acids; Chirality; Peptide Bond; Henderson-Hasselbalch Equation;* *Link: Amino Acid Structures at pH=7.4 Amino Acid Chart with pKa Table*
L6 R 1/24 PS5 Due Quiz 3	***Lecture 6. Protein Structure*** *(Brown 3.2-3.4 - Primary, Secondary, Tertiary, Quaternary Protein Structure, Protein Folding)* *Primary Structure, Disulfide Bonds, Secondary Structure - Alpha Helices and Beta Sheets, Tertiary/Quaternary Structures and Associated Noncovalent Interactions, Prions, PostTranslational Protein Modifications* *Wiki: Protein Structure Disulfide Bonds* *Kimball's Biology Pages: Proteins; Polypeptides;* *Kimball's Biology Pages: Protein Structure: Primary; Secondary; Tertiary; Quaternary*
L7 T 1/29 Quiz 4	***Lecture 7. Chemical Kinetics***
L8 R 1/31 PS6 Due	***Lecture 8. Enzymes: Structure and Function*** *(Brown 7.2.1, 7.2.2 - Enzymes as Catalysts & Factors Affecting Reaction Rates)* *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-Menten Model of Enzyme-Catalyzed Reactions* *Kimball's Biology Pages: Enzymes*

	Kimball's Biology Pages: Enzyme Kinetics
L9 T 2/5 PS7 Due	***Lecture 9. Enzymes as Drug Targets*** *(Brown 7.2.3 - Inhibitors and their Effects on Enzymes)* *Active Site Inhibitors, Allosteric Inhibition, Competitive / Non-Competitive Inhibitors, Suicidal Substrates* *Wiki: Enzymes; Enzyme Inhibitors*
L10 R 2/7 Quiz 5	***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*
L11 T 2/12 PS-8	***Lecture 11. Medical Approaches to Inflammation II*** *(Brown Box 17.4 Zinc Fingers)* *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*
L12 R 2/14 Quiz 6	***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;*
L13 T 2/19	***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;*
T1 R 2/21 Midterm	***Mid-Term Examination on Material from Lectures 1-13*** A Few Practice Problems....
L14 T 2/26	***Lecture 14. Nucleic Acids as Drug Targets*** *(Brown 4.1 - The Structure of DNA)* *Structure of DNA, Central Dogma, Intercalating Drugs, Alkylating & Metallating Agents, Cisplatin, 5-FU* *Wiki: Akylating Agents; Sulfur Mustard; Cisplatin;*
L15 R 2/28	***Lecture 15. Receptor Structure and Signal Transduction I – Overview of Ion Channel Receptors*** *(Brown 5.2.2 - Membranes as Selective Barriers)* *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*

L16 T 3/5 PS9 Due	*Gradients, Ion Movements and Resulting Inhibitory/Excitatory Potential Changes* *UCSF Reading: "Diffusion and Transport Across Membranes" Section on ATP-Driven Ion Pumps (pages 73-77)* *Wiki: Neuron; Membrane Potential; Na+/K+-ATPase* *McGraw-Hill: Sodium-Potassium-ATP Pump*
L17 R 3/7	***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 T 3/19 Quiz 7	***Lecture 18. Cholinergics*** *Nervous System, Cholinergic System, Acetylcholine Structure & Receptor Binding, Cholinergic Antagonists, Acetylcholinesterase Inhibitors*
L19 R 3/21	***Lecture 19. Adrenergics*** *Geometry of Adrenergic Receptors, Main Types of Norepinephrine Receptors, Interaction of Adrenergic Receptors with Neurotransmitters, MOA of Activated Receptors*
L20 T 3/26	***Lecture 20. Psychoactive Drugs I: Stimulants and Tranquilizers*** *Handout:*
L21 R 3/28	***Lecture 21. Psychoactive Drugs II: Anti-Depressants*** *Handout:*
C1 T 4/2	***Compensatory Time for Review Paper Preparation***
L22 R 4/4	***Lecture 22. Psychoactive Drugs III: Anti-Psychotics and Hallucinogens*** *Handout*
L23 T 4/9	***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 4/11	***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 4/16	***Test 2 Concepts***
R1 R 4/18 Paper Due	***Review***