

<p><b>AMINO ACIDS &amp; PROTEINS</b></p>	<ul style="list-style-type: none"> <li>- Central dogma of molecular biology</li> <li>- Central dogma revisited</li> <li>- Peptide bonds: formation &amp; cleavage</li> <li>- Special cases: histidine, proline, glycine &amp; cysteine</li> <li>- Amino acid structure</li> <li>- Isoelectric point &amp; zwitterions</li> <li>- Classification of amino acids</li> <li>- Four levels of protein structures</li> <li>- Conformational stability: protein folding &amp; denaturation</li> </ul>	<p><b>GENE CONTROL</b></p>	<ul style="list-style-type: none"> <li>- Jacob-Monod: The Lac operon</li> <li>- DNA &amp; chromatin regulation</li> <li>- Regulation of transcription</li> <li>- Post-transcriptional regulation</li> <li>- Non-coding RNA (ncRNA)</li> <li>- Oncogenes</li> <li>- Tumor Suppressors</li> </ul>
<p><b>ENZYME STRUCTURE &amp; FUNCTION</b></p>	<ul style="list-style-type: none"> <li>- Enzyme structure &amp; function</li> <li>- Intro to enzymes &amp; catalysis</li> <li>- Enzymes &amp; activation energy</li> <li>- Induced fit model of enzyme catalysis</li> <li>- Six types of enzymes</li> <li>- Cofactors, coenzymes, &amp; vitamins</li> <li>- Enzymes &amp; their environment</li> </ul>	<p><b>GENETIC MUTATIONS</b></p>	<ul style="list-style-type: none"> <li>- Intro to genetic mutations</li> <li>- Different types of mutations</li> <li>- Causes of genetic mutations</li> <li>- Mutagens &amp; carcinogens</li> <li>- Effects of mutations</li> </ul>
<p><b>ENZYME KINETICS</b></p>	<ul style="list-style-type: none"> <li>- Intro to enzyme kinetics</li> <li>- Steady states &amp; the Michaelis Menten equation</li> <li>- Cooperativity</li> <li>- Allosteric regulation &amp; feedback loops</li> <li>- Non-enzymatic protein function</li> <li>- Covalent modifications to enzymes</li> </ul>	<p><b>MENDELIAN GENETICS</b></p>	<ul style="list-style-type: none"> <li>- Intro to Mendelian genetics</li> <li>- Co-dominance &amp; incomplete dominance</li> <li>- Worked example: Punnett squares</li> <li>- Hardy-Weinberg equation</li> <li>- Applying the Hardy-Weinberg equation</li> </ul>
<p><b>DNA</b></p>	<ul style="list-style-type: none"> <li>- Molecular structure of DNA</li> <li>- Antiparallel structure of DNA</li> <li>- Telomeres &amp; single copy of DNA</li> <li>- Leading &amp; lagging strand</li> <li>- Transcription &amp; mRNA processing</li> <li>- Speed &amp; precision of DNA replication</li> <li>- Translation</li> <li>- Differences in translation</li> <li>- DNA Repair 1</li> <li>- DNA Repair 2</li> <li>- Semi conservation replication</li> <li>- Protein modification</li> <li>- Jacob Monod lac operon</li> <li>- DNA structure &amp; function</li> </ul>	<p><b>DNA TECHNOLOGY</b></p>	<ul style="list-style-type: none"> <li>- Gel electrophoresis</li> <li>- Polymerase Chain Reaction (PCR)</li> <li>- DNA Libraries &amp; generating cDNA</li> <li>- DNA cloning &amp; recombinant DNA</li> <li>- Hybridization (microarray)</li> <li>- Expressing cloned genes</li> <li>- Southern Blot</li> <li>- DNA sequencing</li> <li>- Gene expression &amp; function</li> <li>- Applications of DNA technologies</li> <li>- Safety &amp; ethics of DNA technologies</li> </ul>

<p><b>CHROMOSOMAL INHERITANCE</b></p>	<ul style="list-style-type: none"> <li>- Evidence that DNA is genetic material 1</li> <li>- Evidence that DNA is genetic material 2</li> <li>- Sex-linked traits</li> <li>- Worked example: Punnett squares</li> <li>- Genetic recombination</li> <li>- Gene mapping</li> <li>- Extranuclear inheritance 1</li> <li>- Extranuclear inheritance 2</li> </ul>	<p><b>CARBOHYDRATES</b></p>	<ul style="list-style-type: none"> <li>- Naming</li> <li>- Configuration, epimers &amp; names</li> <li>- Cyclic structures &amp; anomers</li> <li>- Di &amp; polysaccharides</li> <li>- Keto-enol tautomerization</li> </ul>
<p><b>EVOLUTION &amp; POPULATION DYNAMICS</b></p>	<ul style="list-style-type: none"> <li>- Evolution &amp; natural selection</li> <li>- Fitness &amp; fecundity</li> <li>- Alternative selection</li> <li>- Genetic drift, bottleneck effect &amp; founder effect</li> <li>- Inbreeding</li> <li>- Reproductive isolation</li> </ul>	<p><b>CARBOHYDRATE METABOLISM</b></p>	<ul style="list-style-type: none"> <li>- PPP article</li> <li>- Cellular respiration introduction</li> <li>- Overview of glycolysis</li> <li>- Gluconeogenesis: the big picture</li> <li>- Gluconeogenesis: unique reactions</li> <li>- Regulation of glycolysis &amp; gluconeogenesis</li> <li>- Pentose Phosphate pathway</li> </ul>
<p><b>PRINCIPLES OF BIOENERGETICS</b></p>	<ul style="list-style-type: none"> <li>- Gibbs free energy introduction</li> <li>- Analogy for Gibbs Free energy</li> <li>- Heat transfer</li> <li>- Enthalpy</li> <li>- Le Chatelier's principle</li> <li>- Thermodynamics vs kinetics</li> </ul>	<p><b>KREBS CYCLE &amp; OXIDATIVE PHOSPHORYLATION</b></p>	<ul style="list-style-type: none"> <li>- The citric acid cycle article</li> <li>- Krebs/citric acid cycle</li> <li>- Regulation of pyruvate dehydrogenase</li> <li>- Regulation of Krebs-TCA cycle</li> <li>- Electron Transport Chain</li> <li>- Oxidative phosphorylation article</li> <li>- Oxidative phosphorylation &amp; chemiosmosis</li> <li>- Regulation of oxidative phosphorylation</li> <li>- Mitochondria, apoptosis, &amp; oxidative stress</li> <li>- Calculating ATP produced in cellular respiration</li> </ul>

<p><b>OVERVIEW OF METABOLISM</b></p>	<ul style="list-style-type: none"> <li>- Overview of metabolism: anabolism &amp; catabolism</li> <li>- ATP: adenosine triphosphate</li> <li>- ATP hydrolysis: Gibbs free energy</li> <li>- ATP hydrolysis: transfer of a phosphate group</li> <li>- Oxidation &amp; reduction review</li> <li>- Oxidation &amp; reduction in metabolism</li> <li>- Electron carrier molecules</li> <li>- ATP hydrolysis mechanism</li> </ul>	<p><b>FAT &amp; PROTEIN METABOLISM</b></p>	<ul style="list-style-type: none"> <li>- Digestion, Mobilization, &amp; Transport of Fats - P. I</li> <li>- Digestion, Mobilization, &amp; Transport of Fats - P. II</li> <li>- Fatty Acid Synthesis - P. I</li> <li>- Fatty Acid Synthesis - P. II</li> <li>- Overview of Fatty Acid Oxidation</li> <li>- Fatty Acid Oxidation - P. I</li> <li>- Fatty Acid Oxidation - P. II</li> <li>- How does the body adapt to starvation?</li> <li>- Overview of Amino Acid Metabolism</li> </ul>
<p><b>ENDOCRINE SYSTEM</b></p>	<ul style="list-style-type: none"> <li>- Hypothalamus &amp; pituitary gland</li> <li>- Hormone concentration metabolism &amp; negative feedback</li> <li>- Types of hormones</li> <li>- Cellular mechanism of hormone action</li> <li>- From terpenes to steroid p. 1</li> <li>- From terpenes to steroid p. 2</li> </ul>	<p><b>HORMONAL REGULATION</b></p>	<ul style="list-style-type: none"> <li>- Endocrine gland hormone review</li> <li>- Hormone concentration metabolism &amp; negative feedback</li> <li>- Types of hormones</li> <li>- Overview of metabolism: anabolism &amp; catabolism</li> <li>- How does the body adapt to starvation?</li> <li>- Tissue specific metabolism &amp; the metabolic states</li> <li>- Insulin &amp; glucagon</li> <li>- Glucose insulin &amp; diabetes</li> <li>- Production of insulin &amp; glucagon</li> <li>- Hormone control of hunger</li> <li>- Hormones, body mass &amp; obesity</li> </ul>

<p><b>CELL MEMBRANE OVERVIEW</b></p>	<ul style="list-style-type: none"> <li>- Cell membrane introduction</li> <li>- Phospholipid structure</li> <li>- Cell membrane overview &amp; fluid mosaic model</li> </ul>	<ul style="list-style-type: none"> <li>- Cell membrane proteins</li> <li>- Cell membrane fluidity</li> <li>- Membrane dynamics</li> <li>- Fluid mosaic model: CM article</li> </ul>	<p><b>CYTO SKELETON</b></p>	<ul style="list-style-type: none"> <li>- Intro to cytoskeleton</li> <li>- Microfilaments &amp; intermediate filaments</li> <li>- microtubules</li> </ul>
<p><b>CELL- CELL INTER ACTIONS</b></p>	<ul style="list-style-type: none"> <li>- Cell- Cell interactions: how cells talk</li> <li>- Cell junctions</li> <li>- Membrane receptors</li> </ul>	<ul style="list-style-type: none"> <li>- Ligand Gated ion channels</li> <li>- G protein coupled receptors</li> <li>- Enzyme linked receptors</li> </ul>	<p><b>PRO KARYOTES &amp; BACTERIA</b></p>	<ul style="list-style-type: none"> <li>- Overview of Archaea, Protista &amp; bacteria</li> <li>- Bacterial characteristics – Gram staining</li> <li>- Bacterial binary fission</li> </ul>
<p><b>TRANSPORT ACROSS CELL MEMBRANE</b></p>	<ul style="list-style-type: none"> <li>- Passive &amp; active transports across CM</li> <li>- How do things move across CM?</li> <li>- Passive transport via Facilitated Diffusion</li> <li>- Diffusion &amp; osmosis</li> <li>- Glomerular filtration in the nephron</li> </ul>	<ul style="list-style-type: none"> <li>- Sodium – Potassium Pump</li> <li>- 2<sup>nd</sup> active transport in nephron</li> <li>- Exocytosis</li> <li>- Phagocytosis article</li> <li>- Membrane potential p. 1</li> <li>- Membrane potential p. 2</li> <li>- Permeability &amp; membrane potential</li> </ul>	<p><b>VIRUSES</b></p>	<ul style="list-style-type: none"> <li>- Are viruses dead or alive?</li> <li>- Virus structure &amp; classification</li> <li>- Viral replication: lytic or lysogenic</li> <li>- Retroviruses</li> <li>- Subviral particles: viroids &amp; prions</li> </ul>
<p><b>EU KARYOTIC CELLS</b></p>	<ul style="list-style-type: none"> <li>- Cellular organelles &amp; structure</li> <li>- Characteristics of eukaryotic cells</li> <li>- Nucleus</li> <li>- Mitochondria</li> <li>- Endoplasmic reticulum &amp; Golgi apparatus</li> <li>- Lysosomes &amp; peroxisomes</li> <li>- Epithelial &amp; connective tissue</li> </ul>	<p><b>CELLULAR DIVISION</b></p>	<ul style="list-style-type: none"> <li>- Cell cycle phases</li> <li>- Cell cycle control</li> <li>- Loss of cell cycle control in cancer</li> <li>- Fertilization terminology</li> <li>- Zygote differentiating into somatic &amp; germ cells</li> <li>- Mitosis article</li> <li>- Interphase Mitosis</li> <li>- Comparing mitosis vs meiosis</li> <li>- Meiosis article</li> <li>- Phases of meiosis 1</li> <li>- Phases of meiosis 2</li> <li>- Embryonic stem cells</li> <li>- Cancer</li> </ul>	
<p><b>CELLULAR DEVELOPMENT</b></p>	<ul style="list-style-type: none"> <li>- Stem cells</li> <li>- Cellular communication</li> <li>- Mitochondria, apoptosis &amp; oxidative stress</li> <li>- Cellular specialization (differentiation)</li> <li>- Telomeres &amp; cell senescence</li> <li>- Cellular movement</li> </ul>	<p><b>EMBRY OLOGY</b></p>	<ul style="list-style-type: none"> <li>- Egg meets sperm article</li> <li>- Egg, sperm &amp; fertilization</li> <li>- Human embryogenesis</li> <li>- Early embryogenesis</li> <li>- Implantation</li> <li>- Gestation</li> <li>- Germ layer derivatives</li> </ul>	

<p><b>BIOLOGICAL BASES OF BEHAVIOR</b></p>	<ul style="list-style-type: none"> <li>- Structure of the nervous system</li> <li>- Functions of the nervous system</li> <li>- Motor unit</li> <li>- Peripheral somatosensation</li> <li>- Muscle stretch reflex</li> <li>- Autonomic nervous system</li> <li>- Grey &amp; White matter</li> <li>- Upper motor neurons</li> </ul>	<ul style="list-style-type: none"> <li>- Somatosensory tracts</li> <li>- Cerebellum Brainstem</li> <li>- Subcortical cerebrum</li> <li>- Cerebral cortex</li> <li>- Neurotransmitter anatomy</li> <li>- Early methods of studying the brain</li> <li>- Lesion studies &amp; experimental ablation</li> <li>- Modern ways of studying the brain</li> </ul>
<p><b>NEURAL CELLS</b></p>	<ul style="list-style-type: none"> <li>- Intro to neural cell types</li> <li>- Overview of neuron structure</li> <li>- Overview of neuron function</li> <li>- Astrocytes</li> </ul>	<ul style="list-style-type: none"> <li>- Microglia</li> <li>- Ependymal cells</li> <li>- Oligodendrocytes</li> <li>- Schwann cells</li> </ul>
<p><b>NEURON MEMBRANE POTENTIALS</b></p>	<ul style="list-style-type: none"> <li>- Neuron action potentials</li> <li>- Action potential velocity</li> <li>- Neuron graded potential description</li> <li>- Neuron resting potential description</li> <li>- Neuron resting potential mechanism</li> </ul>	<ul style="list-style-type: none"> <li>- Neuron graded potential mechanism</li> <li>- Neuron action potential description</li> <li>- Neuron action potential mechanism</li> <li>- Effects of axon diameter &amp; myelination</li> <li>- Action potential patterns</li> </ul>
<p><b>NEURONAL SYNAPSES</b></p>	<ul style="list-style-type: none"> <li>- Signal propagation</li> <li>- Synapse structure</li> <li>- Neurotransmitter release</li> <li>- Types of neurotransmitters</li> </ul>	<ul style="list-style-type: none"> <li>- Types of neurotransmitters receptors</li> <li>- Neurotransmitter removal</li> <li>- Neuroplasticity</li> </ul>
<p><b>BIOSIGNALING</b></p>	<ul style="list-style-type: none"> <li>- Membrane receptors</li> <li>- Ligand gated Ion channels</li> </ul>	<ul style="list-style-type: none"> <li>- G-protein Coupled Receptors</li> <li>- Enzyme Linked Receptors</li> </ul>
<p><b>ENDOCRINE SYSTEM</b></p>	<ul style="list-style-type: none"> <li>- Endocrine gland hormone review</li> <li>- Hypothalamus &amp; pituitary gland</li> <li>- Hormone concentration metabolism &amp; negative feedback</li> <li>- Types of hormones</li> </ul>	<ul style="list-style-type: none"> <li>- Cellular mechanism of hormone action</li> <li>- From terpenes to steroid p. 1</li> <li>- From terpenes to steroids p. 2</li> </ul>

<b>CIRCULATORY SYSTEM</b>	<ul style="list-style-type: none"> <li>- Meet the heart!</li> <li>- Layers of the heart</li> <li>- Flow through the heart</li> <li>- Two circulations in the body</li> <li>- Lub dub</li> </ul>	<ul style="list-style-type: none"> <li>- Layers of a blood vessels</li> <li>- Arteries vs. Veins</li> <li>- Resistance in a tube</li> <li>- Putting it all together: pressure, flow &amp; resistance</li> <li>- Thermoregulation in the circulatory system</li> </ul>
<b>HEMATOLOGIC SYSTEM</b>	<ul style="list-style-type: none"> <li>- What's inside of blood?</li> <li>- Hemoglobin moves O<sub>2</sub> &amp; CO<sub>2</sub></li> <li>- Bohr effect vs. Haldane effect</li> <li>- Blood types</li> </ul>	<ul style="list-style-type: none"> <li>- How do we make blood clots?</li> <li>- Coagulation cascade</li> <li>- Life &amp; times of RBCs &amp; platelets</li> <li>- Blood cell lineages</li> </ul>
<b>RESPIRATORY SYSTEM</b>	<ul style="list-style-type: none"> <li>- Meet the lungs!</li> <li>- Inhaling &amp; exhaling</li> <li>- How does lung volume change?</li> <li>- O<sub>2</sub> &amp; CO<sub>2</sub> solubility</li> </ul>	<ul style="list-style-type: none"> <li>- Henry's Law</li> <li>- Fick's Law of diffusion</li> <li>- O<sub>2</sub> movement from alveoli → capillaries</li> <li>- Respiratory center</li> <li>- Thermoregulation in the lungs</li> </ul>
<b>LYMPHATIC SYSTEM</b>	<ul style="list-style-type: none"> <li>- Why we need a lymphatic system</li> <li>- How lymphatic vessels move</li> </ul>	<ul style="list-style-type: none"> <li>- Lymphatic system's role in immunity</li> <li>- Lipid &amp; protein transport in the lymphatic system</li> <li>- What is actually in lymph</li> </ul>
<b>IMMUNE SYSTEM</b>	<ul style="list-style-type: none"> <li>- Innate Immunity</li> <li>- Adaptive immunity</li> <li>- Role of phagocytes in innate/nonspecific immunity</li> <li>- Types of immune responses</li> <li>- B cells</li> <li>- APC &amp; MHC II complexes</li> </ul>	<ul style="list-style-type: none"> <li>- Helper T cells</li> <li>- Cytotoxic T cells</li> <li>- Review of B cells, CD<sup>4</sup>+ T cells &amp; CD<sup>8</sup>+ T cells</li> <li>- Clonal selection</li> <li>- Self vs non self-immunity</li> <li>- How white blood cells move around</li> <li>- Blood cell lineages</li> </ul>
<b>RENAL SYSTEM</b>	<ul style="list-style-type: none"> <li>- Renal physiology: GF</li> <li>- Tubular reabsorption article</li> <li>- Renal physiology: counter current X</li> <li>- Meet the kidneys!</li> <li>- Kidney function &amp; anatomy</li> <li>- GF in the nephron</li> </ul>	<ul style="list-style-type: none"> <li>- Changing GFR</li> <li>- Countercurrent X in the kidney</li> <li>- Secondary active transport in the nephron</li> <li>- Urination</li> <li>- Kidney &amp; nephron</li> </ul>
<b>RENAL REGULATION OF BLOOD PRESSURE</b>	<ul style="list-style-type: none"> <li>- Overview of the RAAS System</li> <li>- Renin production in the kidneys</li> <li>- Activating angiotensin 2</li> <li>- Angiotensin 2 raises BP</li> </ul>	<ul style="list-style-type: none"> <li>- Aldosterone raises BP &amp; lowers K</li> <li>- Aldosterone removes acid from the blood</li> <li>- ADH secretion</li> <li>- ADH effects on blood pressure</li> <li>- Aldosterone &amp; ADH</li> </ul>

<p align="center"><b>GASTROINTESTINAL SYSTEM</b></p>	<ul style="list-style-type: none"> <li>- Meet the GI tract!</li> <li>- Mouth</li> <li>- Teeth</li> <li>- Esophagus</li> <li>- Stomach</li> <li>- Small Intestine 1: structure</li> <li>- Small Intestine 2: digestion</li> <li>- Small intestine 3: absorption</li> </ul>	<ul style="list-style-type: none"> <li>- Liver</li> <li>- Hepatic lobule</li> <li>- Biliary tree</li> <li>- Exocrine pancreas</li> <li>- Endocrine pancreas</li> <li>- Colon, rectum &amp; anus</li> <li>- Control of GI tract</li> </ul>
<p align="center"><b>MUSCULAR SYSTEM</b></p>	<ul style="list-style-type: none"> <li>- Myosin &amp; actin</li> <li>- How tropomyosin &amp; troponin regulate muscle contraction</li> <li>- Role of the sarcoplasmic reticulum in muscle cells</li> <li>- Anatomy of skeletal muscle cell</li> <li>- Three types of muscle</li> </ul>	<ul style="list-style-type: none"> <li>- Motor neurons</li> <li>- Neuromuscular junction &amp; motor endplate</li> <li>- Type 1 &amp; 2 muscle fibers</li> <li>- Calcium puts myosin to work</li> <li>- Muscle innervation</li> <li>- Autonomic vs. somatic nervous system</li> <li>- Thermoregulation by muscles</li> </ul>
<p align="center"><b>SKELETAL SYSTEM</b></p>	<ul style="list-style-type: none"> <li>- Skeletal structures &amp; function</li> <li>- Microscopic structure of bones</li> <li>- Cellular structure of bone</li> </ul>	<ul style="list-style-type: none"> <li>- Skeletal endocrine control</li> <li>- Cartilage</li> <li>- Ligament, tendons &amp; joints</li> </ul>
<p align="center"><b>INTEGUMENTARY SYSTEM</b></p>	<ul style="list-style-type: none"> <li>- Meet the skin! (overview)</li> <li>- What's the skin?</li> <li>- What lies beneath epidermis?</li> <li>- Where do nails &amp; hair come from?</li> <li>- What's in sweat?</li> <li>- LeBron asks: Why does sweating cool you down?</li> </ul>	<ul style="list-style-type: none"> <li>- Overview of sensation &amp; Meissner's corpuscle</li> <li>- Pacinian corpuscle &amp; Merkle's disk</li> <li>- Ruffini's ending &amp; hair follicle receptors</li> <li>- Pain &amp; temperature</li> <li>- Thermoregulation by muscles</li> </ul>
<p align="center"><b>REPRODUCTIVE SYSTEM</b></p>	<ul style="list-style-type: none"> <li>- Welcome to the reproductive system</li> <li>- Anatomy of the male repro system</li> <li>- Transport of sperm via erection &amp; ejaculation</li> <li>- Spermatogenesis</li> <li>- Testosterone</li> <li>- Basics of egg development</li> <li>- Ovarian cycle</li> <li>- Meet the placenta!</li> </ul>	<ul style="list-style-type: none"> <li>- Reproductive cycle graph - follicular phase</li> <li>- Reproductive cycle graph - luteal phase</li> <li>- Estrogen</li> <li>- Maternal changes in pregnancy</li> <li>- Labor (parturition)</li> <li>- Breast anatomy &amp; lactation</li> </ul>



<p><b>Vectors &amp; Scalars</b></p>	<ul style="list-style-type: none"> <li>- Intro to vectors &amp; scalars</li> <li>- Visualizing vectors &amp; scalars</li> <li>- Unit vector notation</li> <li>- Unit vector notation p. 2</li> </ul>	<p><b>Force of Tension</b></p>	<ul style="list-style-type: none"> <li>- Intro to tension</li> <li>- Intro to tension p. 2</li> <li>- Tension in an accelerating system &amp; pie in the face</li> </ul>
<p><b>Speed &amp; Velocity</b></p>	<ul style="list-style-type: none"> <li>- Calculating avg. speed &amp; velocity edited</li> <li>- Solving for time</li> <li>- Displacement from time &amp; velocity</li> <li>- Instantaneous speed &amp; velocity</li> </ul>	<p><b>Forces On Inclined Plane</b></p>	<ul style="list-style-type: none"> <li>- Inclined plane force components</li> <li>- Force of friction keeping block stationary</li> <li>- Ice accelerating down incline</li> <li>- Correction to force of friction keeping block stationary</li> <li>- Force of friction keeping velocity constant</li> <li>- Intuition on static &amp; kinetic friction</li> <li>- Static &amp; kinetic friction example</li> </ul>
<p><b>Acceleration</b></p>	<ul style="list-style-type: none"> <li>- Acceleration at a glance</li> <li>- Acceleration</li> <li>- Airbus A380 take off time</li> <li>- Airbus A380 take off distance</li> <li>- Why distance is area under VT line</li> <li>- Avg. velocity for constant acceleration</li> </ul>	<p><b>Work &amp; Energy</b></p>	<ul style="list-style-type: none"> <li>- Intro to work &amp; energy</li> <li>- Work &amp; energy p. 2</li> <li>- Work &amp; the work- energy principle</li> <li>- Work example problems</li> <li>- Conservation of energy</li> <li>- Work/energy problem with friction</li> <li>- Intro to springs &amp; Hooke's law</li> <li>- Potential energy stored in a spring</li> <li>- Spring potential energy example</li> <li>- Work as the transfer of energy</li> <li>- Work can be negative!</li> <li>- Conservative forces</li> <li>- Power</li> <li>- Intro to mechanical advantage</li> </ul>
<p><b>Newton's Laws &amp; Equilibrium</b></p>	<ul style="list-style-type: none"> <li>- More on newton's 1<sup>st</sup> law of motion</li> <li>- Applying newton's 1<sup>st</sup> law of motion</li> <li>- Newton's 2<sup>nd</sup> law of motion</li> <li>- Unbalanced forces &amp; motion</li> <li>- Newton's 3<sup>rd</sup> law of motion</li> <li>- Center of mass</li> <li>- Intro to torque</li> </ul>	<p><b>Fluids at Rest</b></p>	<ul style="list-style-type: none"> <li>- The buoyant force does not get smaller</li> <li>- Pressure &amp; pascal's principle p.1</li> <li>- Pressure &amp; pascal's principle p.2</li> <li>- Pressure at a depth in a fluid</li> <li>- Finding height of fluid in barometer</li> <li>- Archimedes principle &amp; buoyant force</li> <li>- Buoyant force example</li> <li>- Specific gravity</li> </ul>
<p><b>Normal Forces</b></p>	<ul style="list-style-type: none"> <li>- Balanced &amp; unbalanced forces</li> <li>- Normal force &amp; contact force</li> <li>- Normal force in elevator</li> <li>- Slow sock on Lubricon VI</li> <li>- Normal forces on Lubricon VI</li> </ul>		



<p><b>Fluids in motion</b></p>	<ul style="list-style-type: none"> <li>- Volume flow rate &amp; continuity equation</li> <li>- Bernoulli's equation derivation p.1</li> <li>- Bernoulli's equation derivation p.2</li> <li>- Finding fluid speed exiting hole</li> <li>- More on finding fluid speed through hole</li> <li>- Finding flow rate from Bernoulli's equation</li> <li>- Viscosity &amp; Poiseuille flow</li> <li>- Turbulence at high velocities &amp; Reynold's</li> </ul>	<ul style="list-style-type: none"> <li>- number</li> <li>- Surface tension &amp; adhesion</li> <li>- Venturi effect &amp; pitot tubes</li> <li>- Two circulation in the body</li> <li>- Arteries vs. veins</li> <li>-what's the difference?</li> <li>- Resistance in a tube</li> <li>- Putting it all together: pressure, flow &amp; resistance</li> </ul>	<p><b>Electro Statics</b></p>	<ul style="list-style-type: none"> <li>- Triboelectric effect &amp; charge</li> <li>- Coulomb's law</li> <li>- Conservation of charge</li> <li>- Conductions &amp; insulators</li> <li>- Electric field</li> <li>- Electric potential article</li> <li>- Electric potential energy</li> <li>- Voltage</li> <li>- Electric potential at a point in space</li> </ul>
<p><b>Gas Phase</b></p>	<ul style="list-style-type: none"> <li>- Absolute temperature &amp; the kelvin scale</li> <li>- Pressure &amp; simple mercury barometer</li> <li>- Definition of ideal gas law &amp; ideal gas</li> <li>- Derivation of gas constant using molar volume &amp; STP</li> </ul>	<ul style="list-style-type: none"> <li>- Boyle's Law</li> <li>- Charles's Law</li> <li>- Avogadro's Law</li> <li>- Van der Waals equation</li> <li>- Partial pressure</li> </ul>	<p><b>Current &amp; Resistance</b></p>	<ul style="list-style-type: none"> <li>- Current &amp; resistance article</li> <li>- Intro to circuits &amp; Ohm's law</li> <li>- Resistors in series</li> <li>- Resistors in parallel</li> <li>- Analyzing a more complex resistor circuit</li> <li>- Resistivity &amp; conductivity</li> <li>- Electrolytic conductivity</li> <li>- Voltmeters &amp; Ammeters</li> </ul>
<p><b>Kinetic Molecular Theory of Gas</b></p>	<ul style="list-style-type: none"> <li>- Boltzmann's constant</li> <li>- Heat capacity at constant V/P</li> <li>- Kinetic molecular theory of gas</li> </ul>		<p><b>Capacitors</b></p>	<ul style="list-style-type: none"> <li>- Capacitors article</li> <li>- Dielectric article</li> <li>- Capacitors &amp; capacitance</li> <li>- Capacitance</li> <li>- Energy of a capacitor</li> <li>- Capacitors in series</li> <li>- Capacitors in parallel</li> <li>- Dielectric in capacitors</li> </ul>
			<p><b>Magnetism</b></p>	<ul style="list-style-type: none"> <li>- Using the right-hand rule</li> <li>- Magnetism p. 1</li> <li>- Magnetism p. 2</li> <li>- Magnetism p. 3</li> <li>- Magnetism p. 4</li> </ul>

<p style="text-align: center;"><b>Electro Chemistry</b></p>	<ul style="list-style-type: none"> <li>- Electrochemistry article</li> <li>- Redox reaction from dissolving zinc in copper sulfate</li> <li>- Intro to galvanic/voltaic cells</li> <li>- Electrodes &amp; voltage of galvanic cell</li> <li>- Shorth&amp; notation for galvanic/ voltaic cells</li> <li>- Free energy &amp; cell potential</li> <li>- Standard reduction potentials</li> <li>- Voltage as an intensive property</li> <li>- Using reduction potentials</li> <li>- Spontaneity&amp; redox reactions</li> <li>- Standard cell potential &amp; equilibrium constant</li> <li>- Calculating equilibrium constant from standing cell potential</li> <li>- Nernst equation</li> <li>- Using Nernst equation</li> <li>- Concentration cell</li> <li>- Intro to electrolysis</li> <li>- Quantitative electrolysis</li> <li>- Electrolysis of molten sodium chloride edited</li> <li>- Lead storage battery</li> <li>- Nickel-cadmium battery</li> </ul>	<p style="text-align: center;"><b>Sound</b></p>	<ul style="list-style-type: none"> <li>- Sound is a longitudinal wave</li> <li>- Production of sound</li> <li>- Sound properties</li> <li>- Speed of sound</li> <li>- Relative speed of sound in SLG</li> <li>- Decibel scale</li> <li>- Why do sounds get softer?</li> <li>- Ultrasound medical imaging</li> <li>- Standing waves in open tubes</li> <li>- Standing waves in close tubes</li> <li>- Doppler effect introduction</li> <li>- Doppler effect formula for observed frequency</li> <li>- Doppler effect formula when source is moving away</li> <li>- When the source &amp; wave move at same velocity</li> <li>- Doppler effect for a moving observer</li> <li>- Doppler effect: reflection off moving object</li> </ul>
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<p><b>Light &amp; Electro Magnetic Radiation</b></p>	<ul style="list-style-type: none"> <li>- Light &amp; electromagnetic radiation questions</li> <li>- Electromagnetic waves &amp; the electromagnetic spectrum</li> <li>- Polarization of light, linear &amp; circular</li> <li>- Diffraction &amp; constructive &amp; destructive interference</li> <li>- Wave interference</li> <li>- Young's double slit introduction</li> <li>- Young's double slit equation</li> <li>- Young's double slit problem solving</li> <li>- Diffraction grating</li> <li>- Single slit interference</li> <li>- More on single slit interference</li> <li>- Thin Film Interference p. 1</li> <li>- Thin Film Interference p. 2</li> <li>- Photon Energy</li> </ul>	<p><b>Protein Nuclear Magnetic Resonance</b></p>	<ul style="list-style-type: none"> <li>- Proton nuclear magnetic resonance questions</li> <li>- Magnetic resonance imaging</li> <li>- Introduction to proton NMR</li> <li>- Nuclear shielding</li> <li>- Chemical equivalence</li> <li>- Chemical shift</li> <li>- Electronegativity &amp; chemical shift</li> <li>- Diamagnetic anisotropy</li> <li>- Integration</li> <li>- Spin-spin splitting (coupling)</li> <li>- Multiplicity: <math>n + 1</math> rule</li> <li>- Coupling constant</li> <li>- Complex splitting</li> <li>- Hydrogen deficiency index</li> <li>- Proton NMR practice 1</li> <li>- Proton NMR practice 2</li> <li>- Proton NMR practice 3</li> </ul>
<p><b>Infrared &amp; UV/ Visible Spectroscopy</b></p>	<ul style="list-style-type: none"> <li>- Infrared &amp; Ultraviolet/Visible spectroscopy questions</li> <li>- Introduction to infrared spectroscopy</li> <li>- Bonds as springs</li> <li>- Signal characteristics - wavenumber</li> <li>- IR spectra for hydrocarbons</li> <li>- Signal characteristics - intensity</li> <li>- Signal characteristics - shape</li> <li>- Symmetric &amp; Asymmetric Stretching</li> <li>- IR Signals for Carbonyl Compounds</li> <li>- IR Spectra Practice</li> <li>- UV/Visible Spectroscopy</li> <li>- Absorption in The Visible Region</li> <li>Conjugation &amp; Color</li> </ul>	<p><b>Thin Lenses</b></p>	<ul style="list-style-type: none"> <li>- Thin lens sign conventions</li> <li>- Convex lens</li> <li>- Convex lenses examples</li> <li>- Concave lens</li> <li>- Object image &amp; focal distance relation (proof of formula)</li> <li>- Object image height and distance relationship</li> <li>- Thin lens question &amp; problem solving</li> <li>- Multiple lens system</li> <li>- Diopters, aberration, and the human eye</li> </ul>
		<p><b>Spherical Mirrors</b></p>	<ul style="list-style-type: none"> <li>- Virtual image</li> <li>- Parabolic mirrors &amp; real images</li> <li>- Parabolic mirrors 2</li> <li>- Convex parabolic mirrors</li> <li>- "Objects in the mirror are..." actually images in the mirror</li> </ul>

<p><b>Reflection and refraction</b></p>	<ul style="list-style-type: none"> <li>– Refraction and light bending</li> <li>– Specular &amp; diffuse reflection</li> <li>– Specular &amp; diffuse reflection 2</li> </ul> <ul style="list-style-type: none"> <li>– Refraction &amp; Snell's law</li> <li>– Refraction in water</li> <li>– Snell's law ex: 1</li> <li>– Snell's law ex: 2</li> <li>– Total internal reflection</li> <li>– Dispersion</li> </ul>	<p><b>Electron structure</b></p>	<ul style="list-style-type: none"> <li>– Photoelectric effect</li> <li>– Bohr model radii (derivation using physics)</li> <li>– Bohr model radii</li> <li>– Bohr model energy levels (derivation using physics)</li> <li>– Bohr model energy levels</li> <li>– Absorption and emission</li> <li>– Emission spectrum of hydrogen</li> <li>– Heisenberg uncertainty principle</li> <li>– Quantum numbers</li> </ul>	<ul style="list-style-type: none"> <li>– Quantum numbers for the first four shells</li> <li>– Electron configurations for the first period</li> <li>– Electron configurations for the second period</li> <li>– Electron configurations for the third and fourth periods</li> <li>– Electron configurations of the 3d transition metals</li> <li>– Para magnetism and diamagnetism</li> <li>– Electron configurations article</li> </ul>
<p><b>Atomic Nucleus</b></p>	<ul style="list-style-type: none"> <li>– Radioactive decay types article</li> <li>– Decay graphs and half-lives article</li> <li>– Atomic number, mass number, and isotopes</li> <li>– Atomic mass</li> <li>– Mass defect and binding energy</li> <li>– Nuclear stability and nuclear equations</li> <li>– Writing nuclear equations for alpha, beta, and gamma decay</li> </ul> <ul style="list-style-type: none"> <li>– Types of decay</li> <li>– Half-life and carbon dating</li> <li>– Half-life plot</li> <li>– Exponential decay formula proof (can skip, involves calculus)</li> <li>– Introduction to exponential decay</li> <li>– Exponential decay and semi-log plots</li> <li>– More exponential decay examples</li> <li>– Mass spectrometer</li> </ul>	<p><b>Periodic table</b></p>	<ul style="list-style-type: none"> <li>– Electronegativity and bonding</li> <li>– The periodic table - classification of elements</li> <li>– The periodic table - transition metals</li> <li>– Counting valence electrons for main group elements</li> <li>– Atomic and ionic radii</li> </ul>	<ul style="list-style-type: none"> <li>– Ionization energy: group trend</li> <li>– Ionization energy: period trend</li> <li>– First and second ionization energy</li> <li>– Electron affinity: period trend</li> </ul>
		<p><b>Stoichiometry</b></p>	<ul style="list-style-type: none"> <li>– Stoichiometry article</li> <li>– Stoichiometry and empirical formulae</li> <li>– Empirical formula from mass composition edited</li> <li>– Molecular and empirical formulas</li> <li>– The mole and Avogadro's number</li> </ul>	<ul style="list-style-type: none"> <li>– Stoichiometry example problem 1</li> <li>– Stoichiometry</li> <li>– Stoichiometry: Limiting reagent</li> <li>– Limiting reactant example problem 1 edited</li> <li>– Specific gravity</li> </ul>

**Balancing  
Chemical  
equations**

- Balancing chemical equations
- Balancing more complex chemical equations
- Visually understanding balancing chemical equations
- Balancing another combustion reaction
- Balancing chemical equation with substitution
- Balancing Chemical Equations Intuition

**Redox  
Reactions**

- Oxidizing and reducing agents
- Disproportionation
- Balancing redox reactions in acid
- Balancing redox reactions in base

<b>ACID/BASES EQUILIBRIA</b>	<ul style="list-style-type: none"> <li>- Acid-base definitions</li> <li>- Chemistry of buffers and buffers in our blood</li> <li>- <math>K_a</math> and acid strength</li> <li>- Autoionization of water</li> <li>- Definition of pH</li> <li>- Strong acids and strong bases</li> <li>- Weak acid equilibrium</li> </ul>	<ul style="list-style-type: none"> <li>- Weak base equilibrium</li> <li>- Relationship between <math>K_a</math> and <math>K_b</math></li> <li>- Acid-base properties of salts</li> <li>- pH of salt solutions</li> <li>- Common ion effect and buffers</li> <li>- Buffer solutions</li> <li>- Buffer solution pH calculations</li> </ul>	<b>STEREOCHEMISTRY</b>	<ul style="list-style-type: none"> <li>- Chiral drugs</li> <li>- Structural (constitutional) isomers</li> <li>- Chiral vs achiral</li> <li>- Stereoisomers, enantiomers, and chirality centers</li> <li>- Identifying chirality centers</li> <li>- R,S system</li> </ul>	<ul style="list-style-type: none"> <li>- R,S practice</li> <li>- Optical activity</li> <li>- Enantiomers and diastereomers</li> <li>- Cis-trans isomerism</li> <li>- E-Z system</li> <li>- Conformations of ethane</li> <li>- Conformational analysis of butane</li> </ul>
<b>TITRATIONS</b>	<ul style="list-style-type: none"> <li>- Titration introduction</li> <li>- Titration calculation example</li> <li>- Titration of a strong acid with a strong base</li> <li>- Titration of a strong acid with a strong base (continued)</li> <li>- Titration of a weak acid with a strong base</li> </ul>	<ul style="list-style-type: none"> <li>- Titration of a weak acid with a strong base (continued)</li> <li>- Titration of a weak base with a strong acid</li> <li>- Titration of a weak base with a strong acid (continued)</li> <li>- Acid-base titration curves</li> <li>- Titration curves and acid-base indicators</li> <li>- Redox titration</li> </ul>	<b>COVALENT BONDS</b>	<ul style="list-style-type: none"> <li>- Single and multiple covalent bonds</li> <li>- Electronegativity and bonding</li> <li>- Intramolecular and intermolecular forces</li> <li>- Intermolecular forces</li> <li>- <math>sp^3</math> hybridization</li> <li>- Steric number</li> </ul>	<ul style="list-style-type: none"> <li>- Molecular polarity</li> <li>- <math>sp^2</math> hybridization</li> <li>- <math>sp</math> hybridization</li> <li>- Worked examples: Finding the hybridization of atoms in organic molecules</li> <li>- Acid-base definitions</li> </ul>
<b>SOLUBILITY EQUILIBRIA</b>	<ul style="list-style-type: none"> <li>- Common polyatomic ions</li> <li>- Dissolution and precipitation</li> <li>- Introduction to solubility and solubility product constant</li> </ul>	<ul style="list-style-type: none"> <li>- Solubility from the solubility product constant</li> <li>- Solubility and the common-ion effect</li> <li>- Solubility and the pH of the solution</li> <li>- Solubility and complex ion formation</li> </ul>	<b>SEPARATIONS &amp; PURIFICATIONS</b>	<ul style="list-style-type: none"> <li>- Simple and fractional distillations</li> <li>- Extractions</li> <li>- Principles of chromatography</li> <li>- Basics of chromatography</li> <li>- Thin layer chromatography (TLC)</li> <li>- Calculating retention factors for TLC</li> <li>- Column chromatography</li> <li>- Gas chromatography</li> <li>- Gel electrophoresis</li> <li>- Resolution of enantiomers</li> </ul>	
<b>DOT STRUCTURES</b>	<ul style="list-style-type: none"> <li>- Drawing dot structures</li> <li>- Formal charge and dot structures</li> <li>- Resonance and dot structures</li> <li>- VSEPR for 2 electron clouds</li> </ul>	<ul style="list-style-type: none"> <li>- VSEPR for 3 electron clouds</li> <li>- VSEPR for 4 electron clouds</li> <li>- VSEPR for 5 electron clouds 1</li> <li>- VSEPR for 5 electron clouds 2</li> <li>- VSEPR for 6 electron clouds</li> </ul>			

<p><b>NUCLEIC ACID, LIPIDS &amp; CARBS</b></p>	<ul style="list-style-type: none"> <li>- Nucleic acid structure 1</li> <li>- Antiparallel structure of DNA strands</li> <li>- Saponification - Base promoted ester hydrolysis</li> <li>- Lipids - Structure in cell membranes</li> <li>- Lipids as cofactors and signaling molecules</li> <li>- Carbohydrates - Naming and classification</li> </ul>	<ul style="list-style-type: none"> <li>- Fischer projections</li> <li>- Carbohydrates - Epimers, common names</li> <li>- Carbohydrates - Cyclic structures and anomers</li> <li>- Carbohydrate - Glycoside formation hydrolysis</li> <li>- Keto-enol tautomerization (by Sal)</li> <li>- Disaccharides and polysaccharides</li> </ul>	<p><b>CARBS</b></p>	<ul style="list-style-type: none"> <li>- Carbohydrates- di and polysaccharides</li> <li>- Carbohydrates - cyclic structures and anomers</li> <li>- Carbohydrates - absolute configuration, epimers, common names</li> </ul>	<ul style="list-style-type: none"> <li>- Carbohydrates - naming and classification</li> <li>- Keto-enol tautomerization (by Jay)</li> </ul>
<p><b>AMINO ACIDS, PEPTIDES, &amp; PROTEINS</b></p>	<ul style="list-style-type: none"> <li>- Central dogma of molecular biology</li> <li>- Central dogma - revisited</li> <li>- Amino acid structure</li> <li>- Peptide bonds: Formation and cleavage</li> <li>- Special cases: Histidine, proline, glycine, cysteine</li> <li>- Isoelectric point and zwitterions</li> </ul>	<ul style="list-style-type: none"> <li>- Classification of amino acids</li> <li>- Four levels of protein structure</li> <li>- Conformational stability: Protein folding and denaturation</li> <li>- The structure and function of globular proteins</li> </ul>	<p><b>ALPHA-CARBON CHEMISTRY</b></p>	<ul style="list-style-type: none"> <li>- Aldol reactions in metabolism</li> <li>- Keto-enol tautomerization (by Jay)</li> <li>- Enolate formation from aldehydes</li> <li>- Enolate formation from ketones</li> <li>- Kinetic &amp; thermodynamic enolates</li> </ul>	<ul style="list-style-type: none"> <li>- Aldol condensation</li> <li>- Mixed (crossed) aldol condensation</li> <li>- Mixed (crossed) aldol condensation using a lithium enolate</li> <li>- Retro-aldol and retrosynthesis</li> <li>- Intramolecular aldol condensation</li> </ul>
<p><b>PROTEINS</b></p>	<ul style="list-style-type: none"> <li>- Amino acid structure</li> <li>- Alpha amino acid synthesis</li> <li>- Classification of amino acids</li> <li>- Peptide bonds: Formation and cleavage</li> </ul>	<ul style="list-style-type: none"> <li>- Four levels of protein structure</li> <li>- Conformational stability: Protein folding and denaturation</li> <li>- Non-enzymatic protein function</li> </ul>	<p><b>ALDEHYDES &amp; KETONES</b></p>	<ul style="list-style-type: none"> <li>- Nomenclature of aldehydes and ketones</li> <li>- Physical properties of aldehydes and ketones</li> <li>- Reactivity of aldehydes and ketones</li> <li>- Formation of hydrates</li> <li>- Formation of hemiacetals and hemiketals</li> <li>- Acid and base catalyzed formation of hydrates &amp; hemiacetals</li> <li>- Formation of acetals</li> <li>- Acetals as protecting groups and thioacetals</li> <li>- Formation of imines and enamines</li> <li>- Formation of oximes and hydrazones</li> <li>- Addition of carbon nucleophiles to aldehydes and ketones</li> <li>- Formation of alcohols using hydride reducing agents</li> <li>- Oxidation of aldehydes using Tollens' reagent</li> <li>- Cyclic hemiacetals and hemiketals</li> </ul>	



<b>ALCOHOLS &amp; PHENOLS</b>	<ul style="list-style-type: none"> <li>– Alcohol nomenclature</li> <li>– Properties of alcohols</li> <li>– Biological oxidation of alcohols</li> <li>– Oxidation of alcohols</li> <li>– Oxidation of alcohols (examples)</li> <li>– Protection of alcohols</li> </ul>	<ul style="list-style-type: none"> <li>– Preparation of mesylates and tosylates</li> <li>– SN1 and SN2 reactions of alcohols</li> <li>– Biological redox reactions of alcohols and phenols</li> <li>– Aromatic stability of benzene</li> <li>– Aromatic heterocycles</li> </ul>	<b>ENZYMES</b>	<ul style="list-style-type: none"> <li>– Introduction to enzymes and catalysis</li> <li>– Induced fit model of enzyme catalysis</li> <li>– Six types of enzymes</li> <li>– An introduction to enzyme kinetics</li> <li>– Allosteric regulation and feedback loops</li> </ul>
<b>CARBOXYLIC ACID</b>	<ul style="list-style-type: none"> <li>– Carboxylic acid reactions overview</li> <li>– Carboxylic acid nomenclature and properties</li> <li>– Reduction of carboxylic acids</li> <li>– Preparation of esters via Fischer esterification</li> <li>– Preparation of acyl (acid) chlorides</li> </ul>	<ul style="list-style-type: none"> <li>– Preparation of acid anhydrides</li> <li>– Preparation of amides using DCC</li> <li>– Decarboxylation</li> <li>– Alpha substitution of carboxylic acids</li> </ul>	<b>KINETICS</b>	<ul style="list-style-type: none"> <li>– Rate of reaction</li> <li>– Rate law and reaction order</li> <li>– Experimental determination of rate laws</li> <li>– First-order reaction (with calculus)</li> <li>– Plotting data for a first-order reaction</li> <li>– Half-life of a first-order reaction</li> <li>– Plotting data for a second-order reaction</li> <li>– First-order reaction example</li> <li>– Second-order reaction (with calculus)</li> <li>– Half-life of a second-order reaction</li> <li>– Second-order reaction example</li> <li>– Zero-order reaction (with calculus)</li> <li>– Collision theory</li> <li>– Arrhenius equation</li> <li>– Forms of the Arrhenius equation</li> <li>– Using the Arrhenius equation</li> <li>– Elementary rate laws</li> <li>– Mechanisms and the rate-determining step</li> <li>– Catalysts</li> <li>– Kinetic and thermodynamic enolates</li> </ul>
<b>CARBOXYLIC ACID DERIVATIVES</b>	<ul style="list-style-type: none"> <li>– Nomenclature and properties of acyl (acid) halides and acid anhydrides</li> <li>– Nomenclature and properties of esters</li> <li>– Nomenclature and properties of amides</li> <li>– Reactivity of carboxylic acid derivatives</li> </ul>	<ul style="list-style-type: none"> <li>– Nucleophilic acyl substitution</li> <li>– Acid-catalyzed ester hydrolysis</li> <li>– Acid and base-catalyzed hydrolysis of amides</li> <li>– Beta-lactam antibiotics</li> </ul>	<b>EQUILIBRIUM</b>	<ul style="list-style-type: none"> <li>– Reactions in equilibrium</li> <li>– Le Chatelier's principle</li> <li>– Changes in free energy and the reaction quotient</li> <li>– Standard change in free energy and the equilibrium constant</li> <li>– Galvanic cells and changes in free energy</li> </ul>

<p><b>BIO ENERGETICS</b></p>	<ul style="list-style-type: none"> <li>- An analogy for Gibbs free energy</li> <li>- Bioenergetics: The transformation of free energy in living systems</li> <li>- Why we need metabolism?</li> <li>- Insulin and glucagon</li> <li>- Tissue specific metabolism and the metabolic states</li> </ul>	<p><b>THERMO CHEMISTRY</b></p>	<ul style="list-style-type: none"> <li>- Phase diagrams</li> <li>- Enthalpy</li> <li>- Heat of formation</li> <li>- Hess's law and reaction enthalpy change</li> <li>- Gibbs free energy and spontaneity</li> <li>- Gibbs free energy example</li> <li>- More rigorous Gibbs free energy / spontaneity relationship</li> <li>- A look at a seductive but wrong Gibbs spontaneity proof</li> <li>- Endothermic vs. exothermic reactions</li> </ul>
<p><b>THERMO DYNAMICS</b></p>	<ul style="list-style-type: none"> <li>- Thermodynamics article</li> <li>- Specific heat and latent heat of fusion and vaporization</li> <li>- Zeroth law of thermodynamics</li> <li>- First law of thermodynamics</li> <li>- First law of thermodynamics problem solving</li> <li>- PV diagrams - part 1: Work and isobaric processes</li> <li>- PV diagrams - part 2: Isothermal, isometric, adiabatic processes</li> <li>- Second law of thermodynamics</li> </ul>		

FOUNDATIONAL CONCEPT #6: PROCESSING THE ENVIRONMENT					
<b>SENSORY PERCEPTION</b>	<ul style="list-style-type: none"> <li>- Visual cues</li> <li>- Sensory adaptation</li> <li>- Weber's law and thresholds</li> <li>- Absolute threshold of sensation</li> <li>- Somatosensation</li> </ul>	<ul style="list-style-type: none"> <li>- The vestibular system, balance, and dizziness</li> <li>- Signal detection theory - part 1</li> <li>- Signal detection theory - part 2</li> <li>- Bottom-up vs. top-down processing</li> <li>- Gestalt principles</li> </ul>	<b>TASTE &amp; SMELL</b>	<ul style="list-style-type: none"> <li>- Pheromones</li> <li>- Olfaction - structure &amp; function</li> <li>- Gustation - structure and function</li> </ul>	
	<ul style="list-style-type: none"> <li>- The structure of the eye</li> <li>- Visual sensory information</li> <li>- The phototransduction cascade</li> <li>- Photoreceptors (rods vs cones)</li> </ul>	<ul style="list-style-type: none"> <li>- Photoreceptor distribution in the fovea</li> <li>- Visual field processing</li> <li>- Feature detection and parallel processing</li> </ul>		<b>SLEEP &amp; CONSCIOUSNESS</b>	<ul style="list-style-type: none"> <li>- States of consciousness</li> <li>- Sleep stages and circadian rhythms</li> <li>- Dreaming</li> <li>- Dream theories</li> <li>- Freud, activation synthesis hypothesis</li> </ul>
<b>SOUND</b>	<ul style="list-style-type: none"> <li>- Auditory structure - p. 1</li> <li>- Auditory structure - p. 2</li> <li>- Auditory processing</li> <li>- Cochlear implants</li> </ul>		<b>DRUG DEPENDENCE</b>		<ul style="list-style-type: none"> <li>- Overview of psychoactive drugs</li> <li>- Psychoactive drugs: Depressants and opiates</li> <li>- Psychoactive drugs: Stimulants</li> <li>- Psychoactive drugs: Hallucinogens</li> <li>- Drug dependence and homeostasis</li> </ul>
	<b>SOMATOSENSATION</b>	<ul style="list-style-type: none"> <li>- Somatosensation</li> <li>- Sensory adaptation and amplification</li> <li>- Somatosensory homunculus</li> </ul>		<ul style="list-style-type: none"> <li>- Proprioception and kinesthesia</li> <li>- Pain and temperature</li> </ul>	<b>ATTENTION</b>

<p><b>MEMORY</b></p>	<ul style="list-style-type: none"> <li>– Information processing model: Sensory, working, and long-term memory</li> <li>– Encoding strategies</li> <li>– Retrieval cues</li> <li>– Retrieval: Free recall, cued recall, and recognition</li> <li>– Memory reconstruction, source monitoring, and emotional memories</li> <li>– Long term potentiation and synaptic plasticity</li> <li>– Decay and interference</li> <li>– Aging and cognitive abilities</li> <li>– Alzheimer's disease and Korsakoff's syndrome</li> <li>– Semantic networks and spreading</li> </ul>	<p><b>EMOTION</b></p>	<ul style="list-style-type: none"> <li>– Emotions: limbic system</li> <li>– Emotions: cerebral hemispheres &amp; prefrontal cortex</li> <li>– ANS &amp; physiological markers of emotions</li> <li>– Three components of emotion &amp; the universal emotions</li> <li>– Theories of Emotion</li> </ul>
<p><b>COGNITION</b></p>	<ul style="list-style-type: none"> <li>– Piaget's stages of cognitive development</li> <li>– Schemas, assimilation, and accommodation</li> <li>– Problem solving</li> <li>– Decision making</li> <li>– Semantic networks and spreading activation</li> <li>– Intelligence</li> <li>– Theories of intelligence</li> <li>– Aging and cognitive abilities</li> <li>– Cognitive dissonance</li> <li>– Information processing model: Sensory, working, and long-term memory</li> </ul>	<p><b>STRESS</b></p>	<ul style="list-style-type: none"> <li>– What is stress?</li> <li>– Stressors</li> <li>– Responding to stress</li> <li>– Physical effects of stress</li> <li>– Behavioral effects of stress</li> <li>– Stress management</li> </ul>
<p><b>LANGUAGE</b></p>	<ul style="list-style-type: none"> <li>– Theories of the early stages of language acquisition</li> <li>– Language and the brain: Aphasia and split-brain patients</li> <li>– Theories of language and cognition</li> <li>– Theories of language development: Nativist, learning, interactionist</li> </ul>		

## FOUNDATIONAL CONCEPT #7: BEHAVIOR

<p style="text-align: center;"><b>BIOLOGICAL BASES OF BEHAVIOR</b></p>	<ul style="list-style-type: none"> <li>- Structure of the nervous system</li> <li>- Functions of the nervous system</li> <li>- Motor unit</li> <li>- Peripheral somatosensation</li> <li>- Muscle stretch reflex</li> <li>- Autonomic nervous system</li> <li>- Gray and white matter</li> <li>- Upper motor neurons</li> <li>- Somatosensory tracts</li> <li>- Overview of the functions of the cerebral cortex</li> <li>- Hemispheric differences and hemispheric dominance</li> </ul>	<ul style="list-style-type: none"> <li>- The old brain</li> <li>- Cerebellum</li> <li>- Brainstem</li> <li>- Subcortical cerebrum</li> <li>- Cerebral cortex</li> <li>- Neurotransmitter anatomy</li> <li>- Early methods of studying the brain</li> <li>- Lesion studies and experimental ablation</li> <li>- Modern ways of studying the brain</li> <li>- Endocrine system and influence on behavior - Part 1</li> <li>- Endocrine system and influence on behavior - Part 2</li> </ul>	<p style="text-align: center;"><b>MOTIVATION &amp; ATTITUDES</b></p>	<ul style="list-style-type: none"> <li>- Motivation article</li> <li>- Physiological concept of positive and negative feedback</li> <li>- Instincts, Arousal, Needs, Drives: Drive-Reduction and Cognitive Theories</li> <li>- Maslow's hierarchy of needs</li> <li>- Incentive theory</li> <li>- Biological and Sociocultural Factors Food, Sex, and Drugs</li> <li>- Components of attitudes</li> <li>- Attitude influences behavior</li> <li>- Behavior influences attitude</li> <li>- Cognitive dissonance</li> <li>- Situational approach</li> </ul>
<p style="text-align: center;"><b>HUMAN DEVELOPMENT</b></p>	<ul style="list-style-type: none"> <li>- Egg, sperm, and fertilization</li> <li>- Early embryogenesis - Cleavage, blastulation, gastrulation, and neurulation</li> <li>- Implantation</li> <li>- Germ layer derivatives</li> <li>- Gestation</li> </ul>	<ul style="list-style-type: none"> <li>- Major motor milestones</li> <li>- Motor development</li> <li>- Neonatal reflexes</li> <li>- Physical development in adolescence</li> <li>- Brain changes during adolescence</li> </ul>	<p style="text-align: center;"><b>THEORIES OF PERSONALITY</b></p>	<ul style="list-style-type: none"> <li>- Situational approach</li> <li>- Psychoanalytic theory</li> <li>- Maslow's hierarchy of needs</li> <li>- Humanistic theory</li> <li>- Biological theory</li> <li>- Behavioral theory</li> <li>- Trait theory</li> </ul>
<p style="text-align: center;"><b>BEHAVIOR &amp; GENETICS</b></p>	<ul style="list-style-type: none"> <li>- Genes, environment, and behavior</li> <li>- Temperament, heredity, and genes</li> <li>- Twin studies and adoption studies</li> <li>- Heritability</li> <li>- Regulatory genes</li> <li>- Gene environment interaction</li> <li>- Adaptive value of behavioral traits</li> </ul>		<ul style="list-style-type: none"> <li>- Observational learning: Bobo doll experiment and social cognitive theory</li> <li>- Defense mechanisms</li> <li>- Freud - Death drive, reality principle, and pleasure principle</li> </ul>	

<b>PSYCHOLOGICAL DISORDERS</b>	<ul style="list-style-type: none"> <li>– What is obsessive compulsive disorder (OCD)?</li> <li>– What is post-traumatic stress disorder?</li> <li>– Introduction to mental disorders</li> <li>– Categories of mental disorders</li> <li>– Schizophrenia</li> <li>– Biological basis of schizophrenia</li> <li>– Biological basis of depression</li> <li>– Anxiety disorders and obsessive-compulsive disorder</li> <li>– Dissociative identity disorder</li> <li>– Somatic symptom disorder and other disorders</li> </ul>	<ul style="list-style-type: none"> <li>– Personality disorders</li> <li>– Sleep disorders</li> <li>– Sleep wake disorders breathing related sleep disorders</li> <li>– Reward pathway in the brain</li> <li>– Drug dependence and homeostasis</li> <li>– Tolerance and withdrawal</li> <li>– Substance use disorders</li> <li>– Biological basis of Parkinson’s disease</li> <li>– Depression and major depressive disorder</li> <li>– Depression and bipolar disorder</li> </ul>	<b>NORMATIVE &amp; NON-NORMATIVE BEHAVIOR</b>	<ul style="list-style-type: none"> <li>– What is normal? Exploring folkways, mores, and taboos</li> <li>– Perspectives on deviance: Differential association, labeling theory, and strain theory</li> <li>– Aspects of Collective Behavior: Fads, Mass Hysteria, and Riots</li> </ul>
			<b>LEARNING</b>	<ul style="list-style-type: none"> <li>– Classical and operant conditioning article</li> <li>– Classical conditioning: Neutral, conditioned, and unconditioned stimuli and responses</li> <li>– Classical conditioning: Extinction, spontaneous recovery, generalization, discrimination</li> <li>– Operant conditioning: Positive-and-negative reinforcement and punishment</li> <li>– Operant conditioning: Shaping</li> <li>– Operant conditioning: Schedules of reinforcement</li> <li>– Operant conditioning: Innate vs learned behaviors</li> <li>– Operant conditioning: Escape and avoidance learning</li> <li>– Observational learning: Bobo doll experiment and social cognitive theory</li> <li>– Long term potentiation and synaptic plasticity</li> <li>– Non associative learning</li> <li>– Biological constraints on learning</li> </ul>
<b>SOCIAL PSYCHOLOGY</b>	<ul style="list-style-type: none"> <li>– Conformity and groupthink</li> <li>– Conformity and obedience</li> <li>– Asch conformity studies (Asch line studies)</li> <li>– Events that inspired the Milgram studies on obedience</li> <li>– Milgram experiment on obedience</li> <li>– What can we learn from the Milgram experiment?</li> </ul>	<ul style="list-style-type: none"> <li>– Zimbardo prison study The Stanford prison experiment</li> <li>– A closer look at the Stanford prison experiment</li> <li>– Factors that influence obedience and conformity</li> <li>– Bystander effect</li> <li>– Social facilitation and social loafing</li> <li>– Agents of socialization</li> </ul>	<b>THEORIES OF ATTITUDE &amp; BEHAVIOR CHANGE</b>	<ul style="list-style-type: none"> <li>– Components of attitudes</li> <li>– Attitude influences behavior</li> <li>– Behavior influences attitude</li> <li>– Persuasion, attitude change, and the elaboration likelihood model</li> <li>– Reciprocal determinism</li> <li>– Locus of control, learned helplessness, and the tyranny of choice</li> <li>– Self-control</li> </ul>

## FOUNDATIONAL CONCEPT #8: INDIVIDUALS AND SOCIETY

<b>SELF - IDENTITY</b>	<ul style="list-style-type: none"> <li>– Self-concept, self-identity, and social identity</li> <li>– Self-esteem, self-efficacy, and locus of control</li> <li>– Overview of theories of development</li> <li>– Freud's psychosexual development</li> <li>– Erikson's psychosocial development</li> </ul>	<ul style="list-style-type: none"> <li>– Vygotsky sociocultural development</li> <li>– Kohlberg moral development</li> <li>– Social influences</li> <li>– George Herbert Mead- The I and the Me</li> <li>– Charles Cooley- Looking glass self</li> </ul>	<b>SOCIAL BEHAVIOR</b>	<ul style="list-style-type: none"> <li>– Proximity and the mere exposure effect</li> <li>– Physical attraction</li> <li>– Similarity</li> <li>– Harlow monkey experiments</li> <li>– Secure and insecure attachment</li> </ul>	<ul style="list-style-type: none"> <li>– Aggression</li> <li>– Altruism</li> <li>– Social support</li> </ul>
<b>PERCEPTION, PREJUDICE &amp; BIAS</b>	<ul style="list-style-type: none"> <li>– Attribution Theory - Basic covariation</li> <li>– Attribution theory - Attribution error and culture</li> <li>– Stereotypes stereotype threat and self-fulfilling prophecies</li> <li>– Emotion and cognition in prejudice</li> <li>– Prejudice and discrimination based on race, ethnicity, power, social class, and prestige</li> </ul>	<ul style="list-style-type: none"> <li>– Stigma - Social and self</li> <li>– Social perception - Primacy recency</li> <li>– Social perception - The Halo Effect</li> <li>– Social perception - The Just World Hypothesis</li> <li>– Ethnocentrism and cultural relativism in group and out group</li> </ul>	<b>SOCIAL INTERACTIONS</b>	<ul style="list-style-type: none"> <li>– Status</li> <li>– Role strain and role conflict</li> <li>– Primary and secondary groups</li> <li>– Ethnocentrism and cultural relativism in group and out group</li> <li>– Dramaturgical approach</li> <li>– Impression management</li> <li>– Aggression</li> <li>– Harlow monkey experiments</li> </ul>	<ul style="list-style-type: none"> <li>– Altruism</li> <li>– Discrimination individual vs institutional</li> <li>– Prejudice vs discrimination</li> <li>– Prejudice and discrimination based on race, ethnicity, power, social class, and prestige</li> <li>– Organizations and bureaucratization</li> <li>– Characteristics of an ideal bureaucracy</li> <li>– Social support</li> </ul>



<b>ATTRIBUTING BEHAVIOR TO PERSONS OR SITUATIONS</b>	<ul style="list-style-type: none"> <li>– Self-esteem, self-efficacy, and locus of control</li> <li>– Self-concept, self-identity, and social identity</li> <li>– Social influences</li> <li>– Locus of control, learned helplessness, and the tyranny of choice</li> </ul>	<b>SELF-PRESENTATION &amp; INTERACTING WITH OTHERS</b>	<ul style="list-style-type: none"> <li>– Charles Cooley- Looking glass self</li> <li>– George Herbert Mead- The I and the Me</li> <li>– Three components of emotion and universal emotions</li> </ul>
<b>BIOLOGICAL EXPLANATIONS OF SOCIAL BEHAVIOR IN ANIMALS</b>	<ul style="list-style-type: none"> <li>– Animal behavior: foraging</li> <li>– Animal communication</li> <li>– Types of animal communication</li> <li>– Mating behavior and inclusive fitness</li> <li>– Evolutionary game theory</li> </ul>	<b>DISCRIMINATION</b>	<ul style="list-style-type: none"> <li>– Examples of discrimination in society today</li> <li>– Discrimination individual vs institutional</li> <li>– Prejudice and discrimination based on race, ethnicity, power, social class, and prestige</li> <li>– Stereotypes stereotype threat, and self-fulfilling prophecy</li> </ul>

## FOUNDATIONAL CONCEPT #9: SOCIETY AND CULTURE

### SOCIAL STRUCTURES

- Macrosociology vs microsociology
- Social institutions
- Social institutions - education, family, and religion
- Social institutions - government, economy, health and medicine
- Functionalism
- Conflict theory
- Social constructionism
- Symbolic interactionism
- Rational choice-exchange theory
- Social theories overview (part 1)
- Social theories overview (part 2)
- Relating social theories to medicine
- What are social groups and social networks?

### DEMOGRAPHICS

- Demographic structure of society – age
- Demographic structure of society - race and ethnicity
- Demographic structure of society - immigration
- Demographic structure of society - sex, gender, and sexual orientation
- Demographic structure of society overview
- Urbanization
- What is urban growth?
- Population dynamics
- Demographic transition
- Globalization theories
- Globalization- trade and transnational corporations
- Social movements
- Overview of demographics

### CULTURE

- Culture and society
- Overview of culture
- Subculture vs counterculture
- Jim goes to college subculture
- Culture lag and culture shock
- Diffusion
- Mass media
- Evolution and human culture

## FOUNDATIONAL CONCEPT #10: SOCIAL INEQUALITY

### SOCIAL INEQUALITY

- Overview of social inequality
- Upward and downward mobility, meritocracy
- Intergenerational and intragenerational mobility social mobility
- Absolute and relative poverty
- Social reproduction
- Social exclusion (segregation and social isolation)
- Environmental justice
- Residential segregation
- Global inequality
- Prejudice and discrimination based on race, ethnicity, power, social class, and prestige
- Health and healthcare disparities in the US
- Intersectionality
- Class consciousness and false consciousness