Text Book: Knight/Jones/Fields: University Physics for the Life Sciences		
	Topics	**Relevant Lifescience Connections and Examples Discussed**
PHYSICS 2A		
Chapter 2 : Describing motion (Topics: Positi	Units, Position, Time, Displacement, Scalars, Vectors, Velocity, Acceleration, Motion Diagrams, Graphing, Role of Signs, Significant Figures. Sections: 2.1,2.2,2.3,2.4,2.5,2.6	How to measure distance, Height, Length and Time and make Graphs of changes. Learn how to describe mtion and movement in all animals and objects.
Chapter 3 : Motion along a line	Uniform Motion, Instantaneous Velocity, Connection to Calculus, Constant Acceleration, Kinematic Equations and Solution, Free Fall, Projectile Motion	Classifying aspects of motion to understand steady spped vs running, hopping, flying, relation to predators/prey. Trajectory of Leaping/jumping (bush baby & click beetles)
Chapter 4 : Force and Motion	Newtons First and Second Laws, Force & Force Vectors, Qualitative list of important forces, Use of Vectors. Sections: 4.1-4.8	Forces used by animals, micro organisms and plants to support and in locomotion (walking, running etc) . Example: Analyse the forces on knee cap
Chapter 5 : Interacting Systems	Distinguishing Mass and Weight, Frictional Force, Elastic force and brief qualitative discussion of drag force, Newtons Third Law, Newtons Law of Gravity . Sections: 5.1-5.3, Qualitative/Brief 5.4, 5.5,5.6,5.7	Plants and Animals evolve based on the forces experienced in their native physical environment (aquatic or land). Develop understand of attachment and describe elastic phenomena. Friction, Air Drag, water drag. Understand Gravity
Chapter 6 : Equilibrium and Elasticity	Torque, Center of Gravity, Static Equilibrium, Brief discussion of Stability and Balance. Sections 6.1-6.4, Qualitative discussion of 6.5 &6.6)	Torque and Force on bones by tendons and muscles to achieve balance and stability based on elasticity of hard materials as bone
Chapter 7 : Circular and Rotational Motion	Uniform Circular Motion, Centripetal Acceleration, Rigid Body Rotation, Angular Velocity and Acceleration, Moment of Inertia, Qualtitative Discussion of Rolling. Sections 7.1-7.4, If Time permits Section 7.5	Large aspects of Biomechanics is rotational motion of joints. Walking/running speed. Rolling, Spinning and Diving. Centrifuges
Chapter 8 : Momentum	Momentum & Impulsive, Conservation of Momentum, Collisions & Explosions, Angular Momentum, Sections: 8.1-8.4	Jumping. Dving. Rockets and Octopus motion,
Chapter 10 : Work and Energy	Energy Types, Work, Kinetic Energy, Sections: 10.1-10.3	Classification of different forms of Energy that are used by all living and non living systems

Chapter 11 : Interactions and Potential Energ	Gravitational Potential Energy, Principle of Energy Conservation, Elastic Potential Energy, Relating Force and Potential Energy	Energy from Gravity. Falling. Trasformation between Different Forms of Energy and its Conservation. How tendons and muscle's store energy. Energy usage and ffeciency of Animals.
Examples of Home Work Problems		
Prob 3.35:A running mountain lion can make a leap 10.0 m long, reaching a maximum height of 3.0 m. What speed does it leave the ground? What angle does it leave the ground?		
Prob 3.65:Certain insects can achieve seemingly impossible accelerations while jumping. The click beetle accelerates at an astonishing 400g over a distance of 0.56 cm as it rapidly bends its thorax, making the "click" that gives it its name. Assuming the beetle jumps straight up, at what speed does it leave the ground?How much time is required for the beetle to reach this speed?		**Prob 4.22: Scallops eject water from their shells to provide a thrust force. (Figure 1) shows a smoothed graph of actual data for the initial motion of a 40 g scallop speeding up to escape a predator. What is the magnitude of the net Force needed to achieve this motion?**

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PHYSICS 2B			
Chapter 9 : Fluids	Pressure and Causes, Buoyancy, Fluid Flow and continuity equation, Bernoulli' s equation, Brief discussion of Viscosity.	Atmospheric Pressure, Blood and Liquid Pressure Measuement, capillary action and Sap Flow in trees, Importance of Bouyancy in acquatic animals and plants; Water/Blood/Fluid Flow; Benoutli Principle and Bird/insect flight and Fish swim and Seed disbursement	
Chapter 12 : Thermodynamics	Heat, Temperature & First Law, Thermal Expansion, Specific Heat and Heat of Transformation, Calorimetry, Heat Transfer, Ideal gas, Work in gas systems, and Enthalpy	Organisms and Temperature, Temprature Adaptations in Living Systems; Phase Changes; Energy Conservation; Conservation; Transfer of Heat' Insulation; Body Temperature Measurement; Night Vision in Animals/Insects; Adaptability of Animals and Plants	
Chapter 13 : Kinetic Theory	Kinetic Theory of Gases, Thermal Energy,	LIfe and Atom movement/velocity; Warm Body Animals/Plants; Diffusion; Rainfall; Thinderstorms' Animal Body temperature Stabilit; Plant Stabiliy Temperature; Refrigiration and Preservation; Reaction Rates; Energy; Physics of Pressure	
Chapter 14 : Entropy and Free Energy	Entropy & Second Law and use, Gibbs Fre	Entropy and Relationship to Living Organisms; Energy Flow; Need for Exhaust/Waste; Osmosis'; Hydrophobicity	
Chapter 15 : Oscillations and Waves	Simple Harmonic Motion.	Understanding repetitive motion as in heart, lungs, membrane oscillation ; Molecular Vibration; Pendulum & Walking/running speed; Resonance & Hearing	
Chapter 16: Travelling Waves and Sound	Wave motion, Wave types, Wave speed, p	Sound and Light Waves; Hearing in Animals; Ultrasound Imaging and Flow Measurement	
Chapter 17 : Superposition & Standing Waves	Superposition, Standing Waves in Sound a	Musical Instruments; controlling sound, Hearing, Echoes and Animal Sound Generation	
Chapter 18 : Wave Optics	Light Wave, Interference in Films and Dou	Animal-Insect (Beetle)-Shell fish Color/ intefence in feathers and shells. Microscopes and Spectrometers. X ray Diffraction for Protein Structure	
Chapter 19 : Ray Optics	Ray model, Reflection, Refraction, Image f	Image Formation and Eye Function Humans & Animals	
Chapter 20: Optical Instruments	Combined Lens	Discussion of Eye, Camera & Microscopes;	
Examples of Home Work Problems			
Prob: At some instant, the blood pressure in the heart is 1.9 ×104 Pa. Assume the density of blood is the same as water. What is the pressure in an artery 0.20 m below the heart, treating the blood as a nonviscous fluid?			

Prob 9.17:Hippos spend much of their lives in water, but amazingly, they don't swim. They have, like manatees, very little body fat. The density of a hippo's body is approximately 1030 kg/m3 , so it sinks to the bottom of the freshwater lakes and rivers it frequents--and then it simply walks on the bottom. A 1500 kg hippo is completely submerged, standing on the bottom of a lake. What is the approximate value of the upward normal force on the hippo?			
Prob 9.29: A droplet of water sits on a leaf. The contact angle of the water with the leaf is 135◦, and the circumference of the circular contact line is 13 mmWhat is the magnitude of the net upward force exerted on the leaf by the droplet's surface tension? Use γwater = 73 mN/m .		**Prob 9,55:The average density of the body of a fish is 1080 kg/m3. To keep from sinking, a fish increases its volume by inflating an internal air bladder, known as a swim bladder, with air. By what percent must the fish increase its volume to be neutrally buoyant in fresh water? The density of air at 20 ◦C is 1.19 kg/m3**	
Prob: The aorta pumps blood away from the heart at about 40 cm/s and has a radius of about 1.0 cm. It then branches into many capillaries, each with a radius of about 5×10−4 cm carrying blood at a speed of 0.10 cm/s. How many capillaries are there?			

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	Topics	**Relevant Lifescience Connections and Examples Discussed**	
PHYSICS 2C			
Chapter 21 : Electric Forces & Fields	Charges, Coulombs Law, Electric Field of multiple point charges, Electric Field lines, Gauss Law, Electric Field of Sphere, plate and two oppositely charged plates, Motion of charged particle in an Electric Field, Qualitative description of Dipoles and water molecule.	Electric Charges and Fields of Cell Bilayer Membrane, Motion of charges through Bilayer; Origin of Hydrophobic and Hydrophilic and relation to Protein Folding; Pollination Bees/Birds	
Chapter 22 : Electric Potential	Electrical Potential Energy, Potential Energy Between two similar and oppositely charges with connection to ionic bond, Electric Potential of point charges and that between two parallel plate	Bond Energy, Energy to Break Bonds, Definition of Voltage, EKG, Axon Potentials	
Chapter 23 : Biological Applications of Electric Fields & Potentials	Capacitance and Parallel plate Capacitors, Energy Stored, Series and Parallel Capacitors	Electrical Energy Stored in Cell Membrane; Membrane Potential Heart vs Axon; Electrical Work Done; Electric Eels; CPR Paddles;	
Chapter 24 : Current and Resistance	Current, Batteries, Resistance, Ohms Law, Energy . and Powe	Insulators & Conductors; Current Flow in wires;Heat Generation; Power Used; Weight Sensors	
Chapter 25 : Circuits	Simple Circuits	Electricity in Nervous System; Propagation on Nerve Impulses; Timing Circuits for Hearing and Pace Makers	
Chapter 26: Magnetic Fields & Forces	Magnetic Field from Currents, Appendix D-Amperes Law and Magnetic Field from a long straight wire and multiple wires, Magnetic Field from a solenoid, Magnetic force on moving point charge, Magnetic Force between two wires,	Earths Magnetic Field, Magnetic Materials, Magnetic Field in MRI machine; Bacterial Magnetism and Animal/Bird/Fish Migration; Mass Spectrometer	
Chapter 27 : Electromagnetic Induction and Electromagnetic Waves	Magnetic Flux, Faradays Law, Lenz's Law, Application of Electric Power Generation, Electromagnetic Waves	Light; Radio Waves; Electric Power Generation Options for Sustainability;	
Chapter 28 : Quantum Physics	Photoelectric Effect and Energy quantization, Photons, De Broglie Principle and Matter waves, Energy Levels in a Box	Concept of Photon and interaction of light with Atoms and Molecules; X-Rays; Electron Waves and Electron Microscopes	
Chapter 29 : Atoms and Molecules	Bohr Model of Atoms and Hydrogen Emission spectrum	Interaction of Light with Atoms and Molecules and Light absorption and Emission by all Matter.	
Chapter 30: Nuclear Physics	Nucleosynthesis and Isotope production, connection to Peri	Radioactivity, Radio Carbon Dating, Isotope Production for Medicine/Labelling; Power	
Examples of Home Work Problems			
Prob: 21. 3 When a honeybee flies through the air, it develops a charge of +17 pC. (a) How many electrons did it lose in the process of acquiring this charge?			
Question 21.7:A hummingbird gains a significant electric charge while flying. This has consequences: When a charged bird approaches a flower , the stamens of the flower bend toward the bird, even though the stamens are uncharged. (a) Explain how this happens.			