Bio: Semester 1 Exam Review

1. Chemistry of Life
	1. Macromolecules
		1. Lipids
			1. Function: Long term energy storage, provide barriers
			2. Picture: 
		2. Carbohydrates
			1. Function: energy for short term use, structural support
			2. Picture: 
		3. Protein
			1. Function: Transport substances, decrease reaction times, make hormones, provide structural support, basically everything
			2. Picture: <-Amino Acid
		4. Nucleic Acids
			1. Function: Genetic information
			2. Picture: 
	2. Enzymes
		1. Enzymes are biological catalysts
			1. Catalysts speed or induce reactions
		2. 
			1. Active site: where the substrate bonds to the enzyme
			2. Substrate: what bonds to the enzyme
			3. Activation energy: the minimum amount of energy required for a reaction to occur.
		3. Enzymes lower the activation energy required for a reaction to occur.
			1. Pathway of a reaction with an enzyme
				1. 
			2. Exothermic reaction: Energy is released
				1. 
			3. Endothermic reaction: Energy is taken in
				1. 
		4. Temperature and pH vs. enzymes
			1. Enzymes have ideal temperatures and pH levels at which they function best. These are enzyme specific. Extreme temperatures and pH levels can cause the enzymes to denature (change shape) and they will be unable to function.
	3. Water
		1. Properties
			1. Polar, slightly positive and slightly negative ends
				1. The Universal Solvent

Can dissolve things because of its polarity

* + - * 1. Cohesion

Can stick to other water molecules

Causes high heat capacity and high boiling temp

* + - * 1. Adhesion

Can stick to other types of molecules

* 1. Bonds
		1. Covalent
			1. Electrons are shared
		2. Ionic
			1. Electrons are transferred
1. Cells
	1. Cell Theory
		1. Three Tenets
			1. All living things are made of cells
			2. All cells come from pre-existing cells
			3. The cell is the basic unit of life
		2. Took a long time to develop
			1. This is because the microscope was unavailable, as the microscope became more powerful, we learned more about cells
	2. Cell Membrane
		1. Proteins in a sea of fat/ fluid mosaic model
			1. Phospholipid (fat) bi-layer with transport proteins/ carbs/ other proteins
			2. 
		2. The cell membrane controls what enters and exits the cell. The phospholipid bi-layer is selectively permeable, only allowing small, uncharged molecules to pass through. Protein channels and pumps inside the membrane allow for active transport in which larger molecules and molecules moving against the concentration gradient are allowed to enter the cell. As a whole, the cell membrane contributes to the cell’s ability to maintain homeostasis.
		3. Passive Transport
			1. Transport not requiring energy
				1. Diffusion

the net movement of particles from an area of high concentration to an area of low concentration (WITH the concentration gradient)

Osmosis

The diffusion of water

* + 1. Active Transport
			1. Movement requiring energy
			2. Exocytosis
			3. Endocytosis
			4. Pumps of any kind
	1. Organelles
		1. See p. 199
		2. Plant cells have cell walls, chloroplasts, large central vacuoles, rectangleish. Animal cells have centrioles and flagella, central nuclei, roundish.
	2. Domains
		1. Eukaryotic: Cells that contain nuclei and membrane-bound organelles.
		2. Prokaryotic: Cells without a nucleus or other membrane-bound organelles
			1. Eukaryotic cells are much more complex than prokaryotic cells.
1. Energy of Cells
	1. ATP
		1. Adenosine Tri-Phosphate
			1. Energy currency of cells
				1. Energy stored in third phosphate bond
	2. Source
		1. Almost all energy for all life on Earth comes from the Sun
			1. Some comes from thermal vents
	3. Photosynthesis
		1. 6 CO2 + 6 H2O → C6H12O6 + 6 O2
		2. Energy from the Sun excites a molecule of H2O, releasing electrons
			1. The electron goes through the electron transport chain. H+ protons are pumped against their concentration gradient out of the thylakoid. H+ protons move through the ATP Synthase molecule (just like the one from CR) to make ATP from ADP.
			2. The H+ molecules are picked up by NADPH
			3. The ATP is used in the Calvin Cycle (light independent reaction) to fix carbon into usable glucose.
	4. Cellular Respiration
		1. C6H12O6 + 6 O2 ->  6 CO2 + 12 H2O
		2. Glycolysis
			1. Breakdown of glucose, happens in all types
			2. No oxygen required
		3. Kreb’s Cycle and Electron Transport Chain
			1. Can only happen with oxygen
			2. Highest ATP output
		4. Lactic Acid Fermentation
			1. Without oxygen in animals
				1. Lactic acid and 2 ATP
		5. Alcoholic Fermentation
			1. Without oxygen in bacteria/ yeast
				1. alcohol and 2 ATP
	5. Photosynthesis and cellular respiration are cyclical processes. The energy (glucose) and the oxygen produced during photosynthesis are reactants required for cellular respiration, and the products of cellular respiration are the reactants for photosynthesis.
		1. 
2. Cell Cycle
	1. 
		1. Additionally: cytokinesis, cell fully divides after mitosis either via a cleavage furrow (animals) or a cell plate (plants), resulting in two identical daughter cells.
	2. Mitosis



* + - 1. Pre mitosis: centrosomes appear, genetic material is duplicated.
			2. Prophase: Nuclear envelope begins to dissolve, spindle apparatus begins to form, chromatin condenses.
			3. Metaphase: chromosomes align on the metaphase plate, spindle fibers attach at the centromeres.
			4. Anaphase: sister chromatids are pulled apart and towards the poles.
			5. Telophase: nuclear envelope/nucleolus begins to reform, furrow in animal cell, cell plate in plants.
			6. Cytokinesis: cells cleave into two.
		1. Mitosis creates TWO DAUGHTER CELLS IDENTICAL TO THE ORIGINAL CELL
		2. MITOSIS OCCURS IN SOMATIC CELLS
	1. Cancer
		1. Cancer is caused when damaged cells continue to grow and divide unchecked.
			1. Normally, the body simply kills these cells.
				1. This is called apoptosis.
		2. Cancer cells have uncontrolled growth, they also have an abnormal, irregular shape. Cancer cells also spend far less time in interphase than normal, healthy cells.
1. Meiosis
	1. Sexual Cell Reproduction
		1. Asexual reproduction: an organism inherits all of its chromosomes from a single parent
		2. Sexual reproduction: an organism inherits half of its genetic material from one parent and half from another
	2. Produces haploid cells
		1. Diploid: A cell with two copies of each chromosome (in sexually reproducing organisms, one from mother and one from father), often shown as 2n.
		2. Haploid: A cell with half the number of chromosomes as a diploid cell (sex cells before fusing with other cells, after the process of meiosis has reduced their chromosome numbers by half)
		3. Somatic cells are diploid
	3. Causes Genetic Diversity
		1. Because organisms that reproduce sexually have two parents from which to inherit DNA, there is more genetic diversity in sexually reproduced organisms.
	4. MEIOSIS PRODUCES FOUR GENETICALLY UNIQUE HAPLOID DAUGHTER CELLS