unit 1

water -polar molecule -polar colvalent bonds -oxygen end is partial negative and the hydrogens have a partially positive end -cohesive polar covalent bonds -opposite ends of the molecule have opposite charges cohesion -H bonding between H2O creates it (sticky) -allows for the movement of water against gravity -high surface tension -water moves up a tree by transpiration (helped by ____) adhesion -H2O molecules form H bonds with other substances ~capillary action ~meniscus ~water climbs up fiber solvent -water is the universal one -polar water molecules will surround the (+) and (-) ions causing the ions to separate and dissolve -dissolve solutes and create aqueous solutions hydrophilic -some molecules have an affinity for water -polar and ionic molecules -ex: cotton, cellulose, paper hydrophobic -some substances do not have an affinity for water -nonpolar and non ionic substances -ex: fat, glycerol, oils floats -less dense when it is solid, water _____ -forms crystal lattice structure -important because oceans and lakes do not freeze solid ~insulates water below ~seasonal turnover of lakes specific heat -the amount of heat that must be absorbed or lost for 1g to change its temperature by 1C -water had high _____ due to H bonding -resists change in temp -moderates temp on earth evaporative cooling -organisms use to regulate their temperature -ex: sweating -water evaporates through a surface, cooling occurs acidic If [H+]>[-OH] basic If [-OH]>[H+] pH scale -how acidic or basic a solution is -pure water, only 1 molecule in every 554 million is dissociated -most biological fluids have 6-8 -each unit represents a 10-fold difference in H+ and -OH concentrations neutral -If concentration of 2 ions is equal carbon -all life mostly based on this element -important due to its electron configuration ~able to make 4 stable covalent bonds (tetra valence) ~very versatile -tetravalence allows them to be strung together in chains hydrocarbons -combinations of C and H -nonpolar ~not soluble in water ~hydrophobic -stable -very little attraction between molecules -gas at room temp isomers -molecules with the

unit 2

2 organelles that contain their own DNA separate from the chromosome Mitochondria and chloroplast What domains fall under prokaryotic cells? Bacteria and archaea What are the basic features of all cells? Membrane, cytoplasm, chromosomes, ribosomes This organelle synthesizes lipids, metabolizes carbohydrates, detoxifies poison, and stores calcium Smooth ER This cell is characterized by having DNA in a nucleus that is bound by a nuclear envelope and membrane bound organelles Eukaryotic cell This is a membranous sac of hydrolytic enzymes that can digest macromolecules Lysosome The _____ is a selective barrier that allows oxygen, nutrients, and wastes to service the volume of every cell Plasma membrane Ribosomes use the information from the DNA to make what Proteins This cell type is characterized by having no nucleus, but instead a nucleoid, and no membrane bound organelles Prokaryotic cell Diffusion through protein channels is known as what? Facilitated diffusion Site of ribosomal RNA synthesis Nucleolus What happens to a plant cell when placed in pure water (hypotonic solution)? It becomes turgid, cell wall protects from bursting Site of photosynthesis chloroplast These vacuoles pump excess water out of the cell Contractile This ER lacks ribosomes Smooth ER This organelle modifies products of the ER, manufactures certain macromolecules, sorts and packages materials into transport vesicles Golgi apparatus What kind of amino acids will anchor proteins into the membrane? Non-polar What is it called when cells are moving molecules against its concentration gradient, from an area of low concentration to an area of high concentration? What does it require to do this? Active transport, requires ATP Site of cellular respiration Mitochondria These types of vacuoles are formed by phagocytosis Food The logistics of carrying out cellular metabolism sets a limit on the size of cells. The _____ to _____ ratio of a cell is critical. Surface area to volume Both animals and plants have _____ that allow molecules to pass readily between adjacent cells without crossing plasma

same molecular formula but different structures -different chemical properties -different biological functions structural isomers -differ in covalent arrangement of atoms geometric isomers -same covalent relationships by different spatial arrangements enantiomers -isomers that are mirror images of each other -structural differences create important functional significance functional groups -substitute other elements for hydrogen -parts of organic molecules that are involved in chemical reactions -give organic molecules distinctive properties -affect reactivity ~make hydrocarbons hydrophilic ~increase solubility in water macromolecules -by joining carbon to other elements, we form the basis of life -smaller organic molecules join together to form larger molecules polymer -a long molecule consisting of similar or identical building blocks -blocks known as monomers -joined through covalent bonds -dehydration synthesis synthesis -joins monomers by "taking" H2O out -one monomer donates -OH -other monomer donates H+ -together these form H2O -requires energy and enzymes -condensation reaction digestion -use H2O to breakdown polymers -reverse of dehydration synthesis -cleave off one monomer at a time -H2O is split into H+ and -OH -requires enzymes -releases energy -hydrolysis carbohydrates -composed of C, H, O -function: energy, raw materials, energy storage, and structural storage -monomer: sugars sugars -all have carbonyl group and multiple hydroxyl groups -location determines whether it is an aldehyde or ketone -most names end in -ose -classified by number of carbons -when in solution, 5C and 6C structures form rings monosaccarides -simple one monomer sugars -ex: glucose disaccharides -2 monomer sugars -ex: sucrose polysaccharides -large polymer sugars -ex: starch sugar polymers -costs little energy to build -easily reversible=release energy -function: energy storage (starch in plants and glycogen in animals) and structure (cellulose in plants and chitin in arthropods and fungi) starch vs. cellulose -differ in the position of the hydroxyl group on Carbon 1 -S____ has an alpha configuration (normal bonding of glucose monomers) -C_____ has a beta configuration (every other glucose monomer is upside down) -causes differences in organisms' ability to digest it (S easy, C hard) cellulose -major component of plant membranes. Cell junctions These vacuoles are found in many mature plant cells and they hold organic compounds and water Central What are the 3 main types of membrane receptors? G-protein linked, tyrosine kinases, ion channel Oxidative organelles Peroxisomes What happens when you put a red blood cell in pure water (hypotonic solution)? Why? The cell will burst because water rushes into the cell. The _____ is continuous with the nuclear membrane ER membrane Which part of the phospholipid bilayer is considered hydrophobic? Fatty acid tail Which part of the phospholipid bilayer is considered hydrophilic? Phosphate head How does the membrane become semipermeable to polar molecules? Protein channels _____ is a water channel in bacteria. Aquaporin This is the movement of molecules from a HIGH concentration to a LOW concentration. What type of transport is this? Diffusion, passive transport What is osmosis? Diffusion of water across a semi permeable membrane What does hypertonic mean? More solute, less water What does hypotonic mean? Less solute, more water What does isotonic mean? Equal solute, equal water What happens when you water plants with salt water? Why? It will wilt because water will leave the plant and go toward the hypertonic solution (salt water). Signal transduction pathways serve to convert signals on a cell's surface into cellular _____. Responses A _____ is a chemical released by a cell in one part of the body, that sends out messages that affect cells in other parts of the organism. Hormone What are plant hormones called? Phytohormones How are hormones transported? In the blood What are the 3 stages of cell signaling? Reception, transduction, response Reception occurs when a _____ molecule binds to a _____ protein, causing it to change _____. Signal, receptor, shape Membrane receptors that attache phosphates to specific amino acids in proteins are called Receptor tyrosine--kinases The activation of this pathway occurs when a GTP displaces the GDP. G-protein linked receptor pathway Part of the receptr on the cytoplasmic side serves as an enzyme which catalyses the transfer of phosphate groups from ATP to a certain amino acid on a substrate protein. This is an example of what signal transduction pathway? Tyrosine kinase receptor pathway This pathway requires formation of a dimer.

walls -most abundant organic compound on Earth -herbivores have evolved a mechanism to digest it -most carnivores have not evolved -undigested roughage lipids -functions: long term energy storage and concentrated energy, cushions organs, and insulates body -not a true polymer and not large enough to be a macromolecule -big molecules made up of smaller subunits -not a continuous chain -all mix poorly in water (hydrophobic) -include waxes, pigments, fats, pils, phospholipids, and steroids -structure: a glycerol (3 Carbons) and a fatty acid chain triacylcglycerol (triglyceride) -three fatty acid chains linked to a glycerol -combine by an Ester linkage (hydroxyl and carboxyl) -dehydration synthesis saturated fats -all carbons are bonded to hydrogens -there are no carbon to carbon double bonds -long, straight chain -most animals fats -solid at room temp. (contributes to cardiovascular disease, atherosclerosis) unsaturated fats -contains carbon to carbon double bonds in the fatty acids -C=C double bonds in the fatty acids -plant and fish fats -vegetable oils -liquid at room temp (the kinks made by double bonded C prevent the molecules from packing tightly together) -mono- and polyphospholipids -structure: glycerol + 2 fatty acids + PO4 (negatively charged) -contains a head and a tail region -fatty acids tails are hydrophobic -PO4 head is hydrophilic -in water, assembles into a bubble (forms a bilayer) -create a barrier for water and define "outside" vs. "inside" -make up the cell membrane steroids -structure: carbon skeleton of four fused rings with different chemicals attached -with a different functional group attached you create a new one -ex: cholesterol and sex hormones cholesterol -important cell component -animal cell membranes -helps keep membrane fluid, flexible and mobile -precursor of all other steroids ~including vertebrate sex hormones -high levels in blood may contribute to cardiovascular disease proteins -most structurally and functionally diverse group -function: involved in almost everything ~enzymes (pepsin, DNA polymerase) ~structure (keratin, collagen) ~carriers and transport (hemoglobin, aquaporin) ~cell communication (signals and receptors) ~defense (antibodies) ~movement (actin and myosin) ~storage (bean seed) -structure: ~monomer amino acids ~polymer polypeptide -can be one or more polypeptide chains folded and

Tyrosine-kinase pathway The signal molecule that binds to a receptor is typically called a what? Ligand What needs to happen to a receptor to initiate the transduction of a signal? Conformational change (change in shape) What is the formula for solute potential? Ys=-iCRT What is the ionization constant for sucrose? What about NaCl? Sucrose = 1 NaCl = 2 What types of cells typically have a pressure potential? What is this due to? Plant cells due to a cell wall what is the pressure potential of an open beaker? 0 How is temperature measured in the water potential equation? Kelvin If the temperature was 39 degrees C, what is the temperature in Kelvin? 312K What is the cell junction of a plant called? Plasmodesmata What is the cell junction of an animal cell called? Gap junction

bonded together -large and complex molecules -complex 3D shape amino acids -structure: central carbon (alpha carbon) -amino group -carboxyl group (acid) -R group (side chain) ~variable group ~different for each ~confers unique chemical properties -physical and chemical properties based on R groups attached peptide bonds -covalent bond between NH2 (amine) of one amino acid and COOH (carboxyl) of another -C-N bond protein structure -a polypeptide chain that has been folded, twisted and coiled into unique shapes -performed as soon as the polypeptide is formed by creating bonds between parts of the chain -the specific structure determines the function primary structure -unique sequence of amino acids -amino acid sequence determined by gene (DNA) -slight change in amino acid sequence can affect protein's structure and its function secondary structure -localized folding or pleating of parts of the protein chain -result of H bonds between repeating structures of polypeptide -weak bonds -α helix and β pleated sheets tertiary structure -whole molecule folding -interactions between distant amino acids -hydrophobic interactions ~cytoplasm is water-based ~nonpolar amino acids cluster away from water -H bonds and ionic bonds -disulfide bridges ~covalent bonds between sulfurs in sulfhydryls (S-H) ~anchors 3D shape quaternary structure -more than one polypeptide chain bonded together -only then does polypeptide become functional protein -hydrophobic interactions denaturation -although proteins fold as they are made, under certain conditions, these proteins will not fold properly -can be caused by heat, change in pH, change in solution, or salinity -will be inactive -some proteins will be able to regain their original structure by removing the elements nucleic acid -function: genetic material -stores information; genes, blueprint for building proteins -transfers information; blueprint for new cells and next generation -monomer: nucleotides RNA -nucleic acid -single helix -controls protein synthesis DNA -nucleic acid -double helix -controls its own synthesis and protégé's as well as instructions for reproduction from one generation to the next nucleotides -made up of three parts -nitrogen (C-N ring) -pentose sugar (5C) ~ribose in RNA ~deoxyribose in DNA -phosphate (PO_4) group -two types: purines and pyrimidines purines -double ring N base

-adenine (A) and guanine (G) pyrimidines -single ring N base -cytosine (C), thymine (T), uracil (U) phosphodiester bond -new base added to sugar of previous base -polymer grows in one direction metabolism -the totality of an organism's chemical reactions -each reaction will follow a pathway -what manages the material being used and formed and the energy needed for the changes metabolic pathway -a specific molecule is altered resulting in a product (needs enzymes in order to be changed) catabolism -breaking down of complex molecules to simpler compounds -releases energy -known as hydrolysis or digestion anabolism -uses energy in order to form bonds/ molecules -go through biosynthetic pathways -dehydration synthesis bioenergetics -the study of how organisms manage their energy resources energy -the capacity to cause change kinetic energy -the energy of an object due to its motion light energy -energy from the sun that cane converted to solar energy, or chemical energy through photosynthesis thermal energy (heat) -energy associated with the random movement of atoms and molecules potential energy -energy not in use, but that an object possesses due to its location or structure chemical energy -the potential of a substance to undergo a chemical reaction and transform, thus releasing energy thermodynamics -the study of energy transformation First Law of Thermodynamics -energy is constant -can change forms, but cannot be created or destroyed -just like matter -"principle of conservation of energy" Second Law of Thermodynamics -all energy transformations increase the entropy of the universe -entropy is the measure of disorder or randomness free energy -measures the portion of a system's energy that can perform work while temperature and pressure are uniform -shows if a process or change will be spontaneous or if energy is needed for a change to occur ~negative=spontaneous ~positive or 0=not spontaneous exergonic reactions -release of free energy from a chemical reaction -ex: digesting polymers endergonic reaction -chemical reaction that requires an input of energy -absorbs free energy from surroundings -ex: building polymers cell work -3 main types ~mechanical (muscle contractions) ~transport (diffusion/transport) ~chemical (endergonic reactions) -coupling reactions to save energy energy coupling -use exergonic (catabolic) reactions to fuel

endergonic (anabolic) reactions -allows for the energy that organisms need to live ATP -adenosine triphosphate -modified nucleotide -adding phosphates is endergonic -P groups unstable, excellent energy donor phosphorylation -released P can transfer to other molecules ~destabilizing them enzymes -speed up reactions by lowering the energy barrier -regulate the movement of molecules through metabolic pathways -a catalytic protein -needed by all reactions for completion -do not change ∆G -hasten a reaction that would occur eventually -selective, determine which chemical processes will occur at any time -substrate specific -catalyze reactions only at the active site -unchanged by a reaction -can catalyze or anabolize a substrate (work towards equilibrium in reactants and products) catalyst -a chemical agent that changes the rate of a reaction without begin consumed by the reaction energy of activation -makes the reactants unstable, increases the speed of the reactant molecules, and creates more powerful collisions -the amount of energy necessary to push the reactants over an energy barrier -at the summit the molecules are at an unstable point, the transition state ∆G -the difference between the free energy of the products and the free energy of the reactants cofactors -nonprotein enzyme helpers -bind permanently to the enzyme or reversibly -ex: zinc, iron, and copper coenzymes -organic cofactors include vitamins or molecules derived from vitamins inhibitors -binding prevents enzymes from catalyzing reactions -binding involving covalent bonds, often irreversible -if weak, reversible competitive inhibition -if the inhibitor binds to the same site as the substrate, it blocks the substrate noncompetitive inhibition -if the inhibitor binds somewhere other than the active site, it blocks the substrate -binding causes the enzyme to change shape, rendering the active site unreceptive at worst or less effective at catalyzing the reaction *^%$The attraction between a hydrogen of one water molecule and the oxygen of another water molecule* Carbon atoms covalently bonded to each other *Carbohydrate-containing layer at the surface of the plasma membrane* Glycocalyx *The major component of the fluid bilateral of a plasma membrane* Phospolipid *Carrier molecule in the plasma membrane* Protein *Steroid affecting the fluidity of the plasma membrane* Cholesterol

ATP synthase (synthetase) in the inner mitochondrial and chloroplast membrane
Triglyceride

By **MariZL**
cheatography.com/marizl/

Not published yet.
Last updated 15th December, 2022.

unit 3

Describe the enzyme mediated process. Key words, ideas, or phrases: Substrates have same charge and shape as active site of enzyme. Causes an induced fit on substrate to enzyme Anabolic versus catabolic Enzymes can do this process over and over Bonus: Example Identify TWO environmental factors the impact enzymatic activity. pH temperature Explain the effect of the two factors you identified. pH: outside of its optimum pH range....the enzymes hydrogen and ionic bonds are disrupted enzymes are proteins so therein structure is disrupted and therefore function is negatively impacted Temperature: An increase of temperature, to a certain degree, increases the reaction rates on the enzymes but past the optimum range of temperatures causes denaturation, which then means the enzyme functions little if at all. A decrease in temperature outside the optimum range will not cause denaturation but will slow reaction rates. Identify THREE components of the ATP molecule. Adenine base sugar (such as ribose) 3 Phosphate groups Explain phosphorylation. Phosphorylation is the addition or removal of a phosphate group from either ADP or ATP. High energy bond is between second and third phosphate group, when broken energy is released Bonus: example Explain why we see plants as green We see plants as green because to chlorophyll, green visible light is the least useful to the plant and therefore is reflected rather than absorbed. The colors of visible light most useful to the plant are red and blue light and therefore these colors of light are absorbed rather than reflected. What is the equation of photosynthesis? $6CO_2 + 6H_2O$ ---solar energy-------> $C_6H_{12}O_6 + 6O_2$ Where do the reactants and products of photosynthesis come from? Carbon dioxide-from the air through stomata on underside of plant's leaves. Water from the soil absorbed through the roots on the plant use cohesion adhesion and transpirational pull through xylem vein to get to chloroplasts in leaves. Glucose made in the Calvin Cycle Oxygen made from the splitting of the water molecules. Identify which organisms utilize glycolysis. All living organisms Bonus: Why? Because all living

unit 3 (cont)

++The bonding of two amino acid molecules to form a larger molecule requires(The release of a water molecule) +++Energetic reaction +++Rate of disappearance of the substrate +++The nucleoli S functions in the production of Ribosomes +++Both contain DNA molecules +++cell components are found in prokaryotic cells except Nuclear envelope +++The organelle that is the major producer of ATP and is found in both heterotrophs and autotrophs is the Mitochondria +++A plant cells are immersed in distilled water, the resulting movement of water into the cells is called Osmosis +++ Intracellular digestion +++ Plasmodesmata

organisms have cytoplasm which is where this process takes place. This is a highly conserved process. Identify the location of glycolysis. Cytoplasm Explain the significance of a highly conserved process and provide an example (from the lecture). The significance of a highly conserved process is that it is retained over time, the same enzymes and its characteristic to all forms of life. Bonus: Example Glycolysis What is substrate-level phosphorylation? Substrate-level phosphorylation is the synthesis of ATP from ADP and PI, through an enzyme-catalyzed reaction. Bonus: example Glycolysis and Krebs Cycle What is oxidative phosphorylation? Oxidative phosphorylation is where ATP is made from ATP and PI, driven by chemiosmosis, or the flow of protons through the ATP synthase. Bonus: This is the last stage of cell respiration. What is the final electron acceptor of photosynthesis? NADP What is the final electron acceptor in cell respiration? Oxygen Describe the process of lactic acid fermentation. Lactic acid fermentation is the process where NADH is oxidized back into NAD+, requiring the pyruvate molecules to reduce to lactic acid molecules. This process begins with glucose, it goes through normal glycolysis, creating ATP and 2 pyruvate molecules. The pyruvate molecules then go through a chemical reaction that change then to lactic acid molecules, all the while oxidizing NADH back into NAD+. Bonus: mentioning substrate level phosphorylation when talking about glycolysis. Explain the selective advantage of lactic acid fermentation vs oxidative phosphorylation. The selective advantage of lactic acid fermentation over oxidative phosphorylation is the fact that oxygen does not have to be present for ATP to be made from ADP and PI. This means that if oxygen is not available to the cell that it can still create ATP. Explain the advantage of oxidative phosphorylation. The advantage of oxidative phosphorylation is the amount of ATP it creates over lactic acid fermentation. Oxidative phosphorylation makes 34-38 ATP molecules whereas lactic acid fermentation only makes 2 ATP molecules. Identify what oxidative phosphorylation requires, which fermentation does not require. Oxygen Identify the inputs and outputs of glycolysis. Inputs: glucose, takes 2 ATP to get going, 2 NAD+ Outputs: 2 pyruvate molecules, net 2 ATP, 2 NADH.