DAYTONA STATE COLLEGE

GENERAL BIOLOGY I
TEST II

REVIEW

TERMS TO KNOW

- Polar
  - A covalently bonded molecule where one atom has the electrons most of the time, leading to partial positive and negative charges
- Nonpolar
  - A covalently bonded molecule where all the electrons are shared equally, and no charge is created
- Hydrophilic
  - A molecule that is attracted to water, typically polar
- Hydrophobic
  - A molecule that repels water, typically nonpolar
- Valence
  - The outermost shell of electrons in an atom, the valence shell is what allows bonding between atoms
- Structural Isomer
  - when molecules with the same molecular formula have bonded together in different orders.
  - Any of two or more chemical compounds, having the same molecular formula but different structural formulas.
- Geometric Isomer
  - A chemical compound having the same molecular formula as another but a different geometric configuration, as when atoms or groups of atoms are attached in different spatial arrangements on either side of a double bond or a ring.
- Enantiomer
  - Differs in spatial orientation around an asymmetrical carbon atom
  - Stereoisomers that are mirror images of one another but cannot be superimposed on each other.

TERMS TO KNOW

- Monosaccharide
  - A single simple sugar, i.e. glucose, fructose, galactose, ribose
- Disaccharide
  - Two simple sugars bonded together, i.e. glucose-glucose: maltose
- Polysaccharide
  - A long chain of simple sugars, i.e. starch, cellulose, and glycogen
- Peptide
  - A short chain of amino acids
- Polypeptide
  - A long chain made up of many amino acids
- Nucleotide
  - A nitrogenous base + a 5-carbon sugar + a phosphate group
- Dehydration Synthesis of Polymers
  - The process of binding two monomers by creating a water molecule
- Hydrolysis of Polymers
  - Breaking apart two bonded monomers by adding water

TERMS TO KNOW

- Primary Structure of Proteins
  - The actual amino acid sequence of a polypeptide
- Secondary Structure of Proteins
  - The alpha helixes and beta pleated sheets formed by the initial folding of the primary structure
- Tertiary Structure of Proteins
  - Further folding of the polypeptide
- Quaternary Structure of Proteins
  - The final structure of the protein, often involves multiple polypeptide chains folding together
- Phospholipid
  - An amphiphilic molecule with a polar head and a nonpolar tail, makes up cell membranes
- Fluid Mosaic Model
  - Proteins and phospholipids in the cell membrane are mobile (fluid), and the proteins are embedded in the membrane(mosaic)
- Phagocytosis
  - Literally "cell-eating", phagocytosis is the process by which large molecules are brought into a cell
- Peptide Bond
  - The bond between two amino acids made when the carboxyl group of one molecule reacts with the amino group of another molecule, causing the release of H_20

TERMS TO KNOW

- Saturated Fatty Acid
  - A fatty acid with all single bonds, fully hydrogenated
- Unsaturated Fatty Acid
  - A fatty acid with one or more double bonds, not fully hydrogenated
- RNA world
  - The theory that states that RNA came before either DNA or Proteins as both the genetic material of a cell and as an Rnzyme functioning as a protein
- Gap Junctions
  - Holes between cells, allows diffusion between cells
- Tight Junctions
  - Hold cells tight together to prevent leakage
- Desmosomes
  - Connects cells together
- Microbial Mats
  - Growths of bacteria
- Stromatolite
  - A fossilized microbial mat, with cells similar to current microbial mats found in lagoons
- Cyanobacteria
  - Blue-green algae, photosynthetic prokaryotes that created oxygen in the early atmosphere

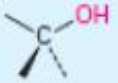
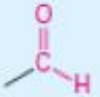
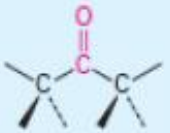
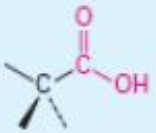
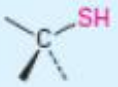
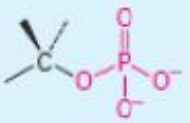
FUNCTIONAL GROUPS

	Formula	Example(s)
Hydroxyl		
Carbonyl - aldehyde		
Carbonyl - ketone		
Carboxyl		
Amino		
Sulfhydryl		
Phosphate		

FUNCTIONAL GROUPS

	Formula	Example(s)
Hydroxyl	OH	Alcohols
Carbonyl	C=O (at the end of a molecule)	Aldehyde
Carbonyl	C=O (in the middle of a molecule)	Ketone
Carboxyl	COOH	Carboxylic Acids
Amino	NH2	Amines
Sulfhydryl	SH	Thiols
Phosphate	PO4	Organic Phosphates

FUNCTIONAL GROUPS

Name	Structure*	Name ending	Example
Alcohol		*-ol*	CH_3OH Methanol
Aldehyde		*-al*	CH_3CH Ethanal
Ketone		*-one*	CH_3CCH_3 Propanone
Carboxylic acid		-oic acid	CH_3COH Ethanoic acid
Amine		*-amine*	CH_3NH_2 Methylamine
Thiol		*-thiol*	CH_3SH Methanethiol
Monophosphate		*phosphate*	$CH_3OPO_3^{2-}$ Methyl phosphate

CONCEPT QUESTIONS

- What element defines organic chemicals vs. inorganic?
  - Carbon
- What are the elements found in the four major organic compounds?
  - Carbon, Oxygen, Hydrogen, Nitrogen, Phosphorus, and Sulfur
- What element is unique to proteins?
  - Sulfur
- What element is unique to nucleic acids?
  - Phosphorus

CONCEPT QUESTIONS

- What are the functions of the four major organic compounds?
  - Proteins: Structure, support, movement, enzymatic activity
  - Lipids: Energy storage, cell membranes
  - Nucleic Acids: Information storage
  - Carbohydrates: Energy

ORGANIC MOLECULES

Major Organic molecule category	Elements	Subunits or monomers	Examples	Larger molecule assembled by what process?
Protein				
Lipid				
Nucleic acid (DNA and RNA)				
Carbohydrate				

ORGANIC MOLECULES

Major Organic molecule category	Elements	Subunits or monomers	Examples	Larger molecule assembled by what process?
Protein	CHONS	Amino Acids	Muscle, Enzyme	Dehydration Synthesis
Lipid	CHO	Fatty Acids/ Triglycerides	Butter, Fat	Dehydration Synthesis
Nucleic acid (DNA and RNA)	CHONP	Nucleotides	DNA, RNA	Dehydration Synthesis
Carbohydrate	CHO	Monosaccharides (simple sugars)	Glucose, Sucrose, Starch	Dehydration Syntheses

CONCEPT QUESTIONS

- How many different amino acids are in the genetic code to make up a polypeptide?
  - There are 20 amino acids
- What bond holds alpha helix and beta pleated sheet in that secondary shape?
  - Hydrogen bonds
- Would a change in amino acid sequence change the shape of the primary, secondary, tertiary or quaternary protein structure?
  - It would change the primary structure, which could result in changes to the other three structures which build upon it
- What bases pair with which bases in DNA and RNA?
  - A pairs with T or U, and C pairs with G
- Which bases are pyrimidines or purines?
  - Pyrimidine: cytosine, thymine, uracil
  - Purine: adenine, guanine
- What would be the RNA sequence that hybridizes to the DNA sequence AAAGGCT?
  - UUUCCGA
- What was Stanley Miller's experiment and what did it show?
  - He recreated Earth's early atmosphere, which showed that organic molecules, such as amino acids and lipids, could form on their own over time

ORGANELLES

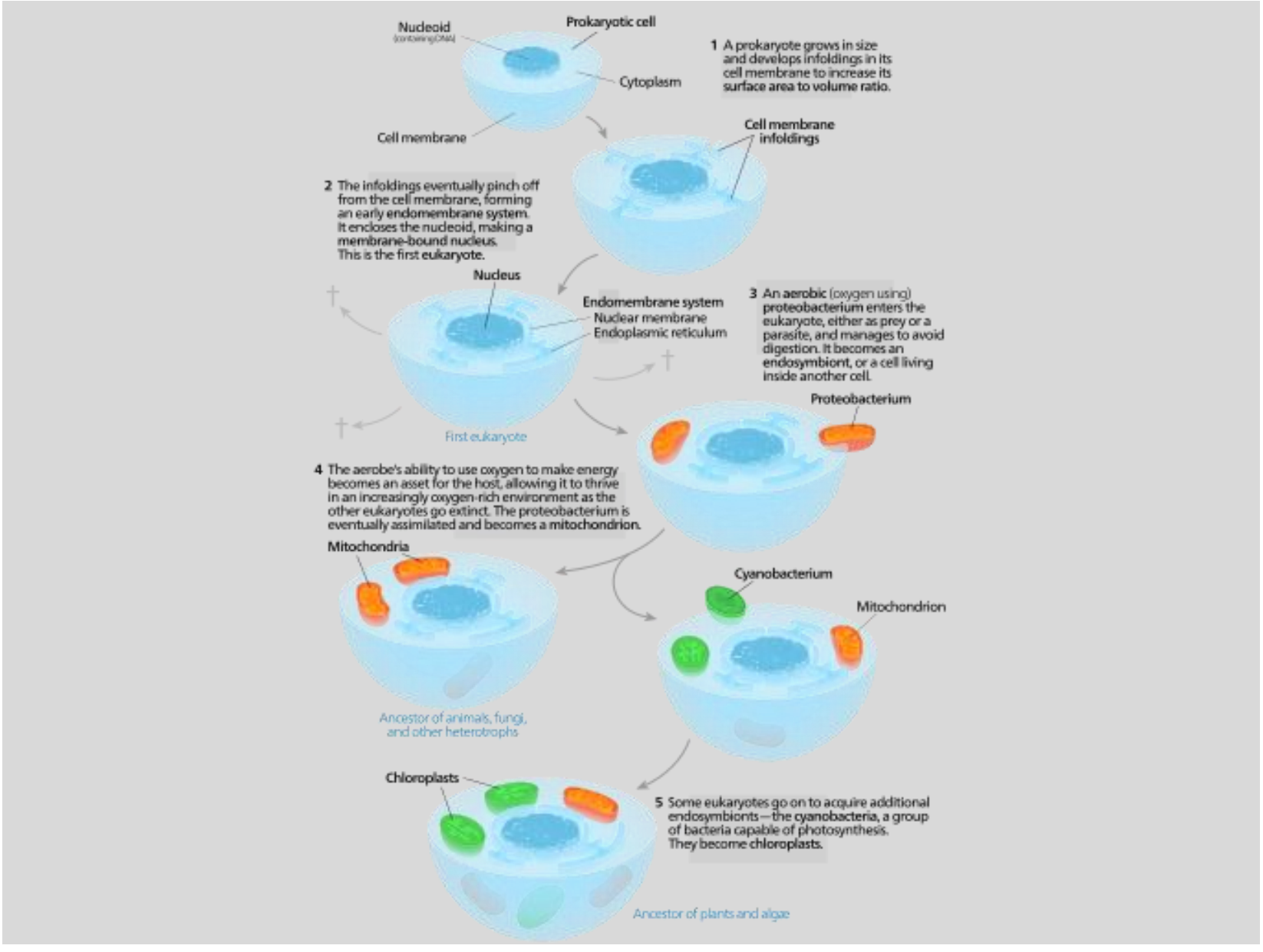
	Function	In prokaryote only, eukaryote only, or both	If in eukaryote, in plant only, animal only or both
Nucleoid			
Nucleus			
Mitochondria			
Chloroplast (also called plastid)			
RER			
SER			
Golgi Apparatus			
Lysosome			
Central Vacuole			
Cilia, Flagella			
Plasma membrane			
Cell Wall			
Cytoplasm			
Cytoskeleton			
Free ribosomes			
Centrioles			

ORGANELLES

	Function	In prokaryote only, eukaryote only, or both	If in eukaryote, in plant only, animal only or both
Nucleoid	a proto-nucleus in prokaryotes, a cluster of dna in the cell	prokayote	
Nucleus	a membrane bound organelle that contains genetic info	eukaryote	**both**
Mitochondria	a membrane bound organelle that produces ATP	eukaryote	**both**
Chloroplast (also called plastid)	a membrane bound organelle that does photosynthesis and makes glucose	eukaryote	**plants**
RER	makes proteins for export	eukaryote	**both**
SER	makes lipids and non-protein products for export	eukaryote	**both**
Golgi Apparatus	packages proteins for transport out of the cell	eukaryote	**both**
Lysosome	vesicle containing digestive enzymes	eukaryote	**animal**
Central Vacuole	fills with water to create turgor pressure	eukaryote	**plant**
Cilia, Flagella	movement	eukaryote	**animal**
Plasma membrane	holds the cell together, separates inside form outside	both	**both**
Cell Wall	adds support and protection to the cell	both	**plant**
Cytoplasm	the fluid and everything held in it inside a cell	both	**both**
Cytoskeleton	support and transport within a cell	eukaryote	**both**
Free ribosomes	make proteins for use inside the cell	both	**both**
Centrioles	play a role in mitosis and the making of cilia and flagella	eukaryote	**animals**

CONCEPT QUESTIONS

- What is the endomembrane system?
  - A system of organelles in eukaryotic cells that make products for use outside the cell
- What happens to a food vacuole as it enters a cell?
  - It meets with a lysosome and its contents are broken down
- What is the flow of information in a cell (hint: start is DNA)?
  - DNA → RNA → Protein
- What are the functions of the parts of the nucleus (nuclear membrane, nuclear pores, and nucleolus)?
  - Nuclear membrane – keeps the nucleus separate from the rest of the cell
  - Nuclear pores – Allow ribosomes and mRNA to enter and exit the nucleus
  - Nucleolus – where ribosomes are made
- What is the endosymbiotic theory for the origin of mitochondria and chloroplasts and what is the evidence for the symbiotic theory of the origin of mitochondria and chloroplasts?
  - Chloroplasts and Mitochondria were once free-living bacteria that were phagocytized and not destroyed, and eventually became part of the cell.
  - Mitochondria and Chloroplast have a two membranes and DNA different than the cell nucleus.


Nucleoid
(containing DNA)
Prokaryotic cell
Cytoplasm
Cell membrane
1 A prokaryote grows in size and develops infoldings in its cell membrane to increase its surface area to volume ratio.
Cell membrane infoldings
2 The infoldings eventually pinch off from the cell membrane, forming an early endomembrane system. It encloses the nucleoid, making a membrane-bound nucleus. This is the first eukaryote.
Nucleus
Endomembrane system
Nuclear membrane
Endoplasmic reticulum
3 An aerobic (oxygen using) proteobacterium enters the eukaryote, either as prey or a parasite, and manages to avoid digestion. It becomes an endosymbiont, or a cell living inside another cell.
Proteobacterium
First eukaryote
4 The aerobe's ability to use oxygen to make energy becomes an asset for the host, allowing it to thrive in an increasingly oxygen-rich environment as the other eukaryotes go extinct. The proteobacterium is eventually assimilated and becomes a mitochondrion.
Mitochondria
Cyanobacterium
Mitochondrion
Ancestor of animals, fungi, and other heterotrophs
Chloroplasts
5 Some eukaryotes go on to acquire additional endosymbionts—the cyanobacteria, a group of bacteria capable of photosynthesis. They become chloroplasts.
Ancestor of plants and algae

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Questions

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