Jonathan Quang 4/28/15

Prelab #7 SLS44-09/Period 4,5

1. Proteins, lipids, and nucleic acids have different structures an functions. Proteins are polypeptide chains of amino acids. Amino acids are composed of a amino group bonded to a central carbon. Oxygen and a carboxylic acid group are attached to the central carbon. To the side of the central carbon is a variable group. A protein carries out many life functions. It can provide structural support, transport materials, act as receptors, be used as hormones, be used as enzymes, gene regulation, and more. The structure of lipids is generally some form of a carboxylic acid group and some form a hydrocarbon chain. The function of lipids is to act as a hormone, waterproofing, energy storage, and it also composes the phospholipid bilayer. The structure of a nucleic acid is a chain of nucleotides. Each nucleotide is composed of a phosphate group connected to a sugar group connected to a nitrogenous base. Nucleic acids generally carry genetic information and are involved with protein synthesis.

2. The process of DNA extraction can be broken up into three basic steps. The first step is homogenization. EDTA/Tris acts as a buffer in this step. Cells are lysed or separated in a blender with the addition of an abrasive, such as onion cells or glass beads, and an EDTA/Tris solution. EDTA will bind ions with a positive charge and a valance of two. This ion will be used as a cofactor of nuclease enzymes, therefore binding it will prevent nuclease from cutting up nucleic acids. The Tris will act as a bugger and raise the pH in preparation for addition of acidic substances. The second step is precipitation. A detergent called SDS is added to the solution because as a soap, it can degrade the lipids and nuclear membranes of the cell. Cold alcohol is soon added, causing DNA to precipitate quickly in an acidic environment whereas other organ material will precipitate slowly. The third step, collection, is done by inserting a glass rod into the solution for the DNA to precipitate on.

3. Soaps can break down certain lipids. The long hydrocarbon end of soaps are non-polar and hydrophobic where as the other end is ionic and hydrophilic. Normally, lipids suspended within water tend to stick to each other, forming a layer. What soap does to this is attach to the lipids and suspend and surround them. This allows the resulting globule containing the soap and lipid to be able to mix with water.

4. A cofactor is an inorganic substance required to catalyze a reaction or speed up the catalysis of the reaction.

5. A buffer is a substance that drives a solution's pH towards a certain level. It is composed of a weak acid and its conjugate base. If a solution gains more H+ ions, becoming more acidic, part of the buffer will attach to the hydrogen ion so that it becomes neutral. When too much H+ ions are removed, part of the buffer's weak acid will compensate.

6.  
 1) Restriction fragment length polymorphism - a molecular marker specific to a single restriction enzyme to find different lengths of two DNA samples after digestion by nucleases.  
2) restriction enzyme - an enzyme generally produced by bacteria the cuts DNA at a specific DNA sequence.  
3) ligase - an enzyme that joins the sugar-phosphate bonds between nucleotides near the end of DNA replication.  
4) PCR - or polymerase chain reaction, is the process by which a segment of DNA is copied rapidly multiple times by repeated denaturation of DNA, laying down of primers, and synthesis by polymerase.  
5.)human genome - the entirety of all the DNA present in human cells.

7. To create DNA fragments for electrophoresis, restriction endonulceases must be used. These enzymes recognize a certain nucleotide sequence of a certain length depending on the enzyme. They then cut the recognized sequence along the entire DNA strand. These fragments are separated by gel electrophoresis. Strands of DNA are suspended in the gel as an electrical current is passed through the gel. Nucleic acids have a negative charge due to their phosphate-sugar back bone, so they are attracted to the positive end of the container holding the gel. Larger DNA fragments will be slowed down as they move, effectively sorting the DNA fragments into layers.

8. Restriction fragment analysis is a procedure that includes gel electrophoresis, but expands upon it. When gel electrophoresis is completed, fluorescent or radioactive complementary DNA strands of the DNA segment in question are added. They should bond to targeted DNA sequence. When the layers of DNA are analyzed, either by checking for fluorescence or by producing images from radioactivity, whether or not the DNA segment in question is present can be seen. This is more accurate than regular gel electrophoresis because a specific segment of DNA can clearly be seen. When differentiating between DNA samples, not only is there a differing amount of layers of evidence that the two samples are very different, but the presence of a specific sequence of genes can also be checked, which may also mean that a specific protein could have been synthesized as well.

Bibliography

Bicarbonate Buffer. (n.d.). Retrieved April 28, 2015, from http://academic.brooklyn.cuny.edu/biology/bio4fv/page/bicarbo.htm

Coenzymes and Cofactors. (n.d.). Retrieved April 28, 2015, from http://academic.brooklyn.cuny.edu/biology/bio4fv/page/coenzy\_.htm

Cooper, G. (2000). The Cell: A Molecular Approach. 2nd edition. Retrieved April 29, 2015, from http://www.ncbi.nlm.nih.gov/books/NBK9950/

DNA Extraction. (n.d.). Retrieved April 28, 2015, from http://learn.genetics.utah.edu/content/labs/extraction/

How Does Soap Work? (1999, January 1). Retrieved April 28, 2015, from http://www.edinformatics.com/interactive\_molecules/soap.htm

Restriction Fragment Length Polymorphism (RFLP). (n.d.). Retrieved April 28, 2015, from http://www.ncbi.nlm.nih.gov/probe/docs/techrflp/

Rice, G. (n.d.). DNA Extraction. Retrieved April 28, 2015, from http://serc.carleton.edu/microbelife/research\_methods/genomics/dnaext.html