Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period: \_\_\_\_\_\_

**Must-Knows: Biochemistry**

**AP Biology Biochemistry Summer Assignment**

**Welcome to AP Biology! It is going to be a great year!**

**Directions: Review Biochemistry in regards to AP Biology as well as introduce concepts that will be covered in AP biology throughout the year.**

**The following assignments will be due Monday, September 10th. The first assignment will count as a test grade. Start this early or when you have some free time. It will make the start of school so much easier.**

**Put the answers to the assignment on a sheet of paper for a binder or a 5 Star Folder.**

**Add questions that you may have about the material for clarification.**

**Any questions please email me at** [**sheaton@bville.org**](mailto:sheaton@bville.org)**.**

**Topic Review Guide**: Biologically Important Molecules, Part 1

(Videos 25-28)

**To Think About**: How do molecules and atoms from the environment build new molecules? In what ways do the subcomponents of biological molecules and their sequences determine the properties of those molecules? What interactions between molecules affect their structure and function?

**Watch:**

**First:** [Mr. Andersen’s “Water: A Polar Molecule” video](http://viewpure.com/DVCYlST6mYQ&feature=plcp)

**Next**: [Mr. Andersen’s “Polymers” video](http://viewpure.com/VigpwmH7E3M&feature=plcp)

**Then**: [Mr. Andersen’s “Carbohydrates” video](http://viewpure.com/_zm_DyD6FJ0)

**And**: [Mr. Andersen’s “Lipids” video](http://viewpure.com/VGHD9e3yRIU&feature=plcp)

**Read:**

**First:** Chapter 2, pages 16-22: Hillis, Principles of Life, 1st ed. (2012).

**Then**: Chapter 2, pages 23-29: Hillis, Principles of Life, 1st ed. (2012).

**Supplementary Resources**: Click the links below for more information to help you learn more about this lesson.

* Austin Community College: [Dissociation of Water](http://www.austincc.edu/biocr/1406/laba/dissociation/dissociation_of_water.swf)
* US Geological Service: [Properties of Water](http://ga.water.usgs.gov/edu/waterproperties.html)
* Sumanas, Inc.: [Properties of Water (animation)](http://www.sumanasinc.com/webcontent/animations/content/propertiesofwater/water.html)
* Crash Course Biology: [That’s Why Carbon is a Tramp](http://viewpure.com/QnQe0xW_JY4&feature=edu&list=PL3EED4C1D684D3ADF)
* Crash Course Biology: [Water—Liquid Awesome](http://viewpure.com/HVT3Y3_gHGg&feature=edu&list=PL3EED4C1D684D3ADF)
* Crash Course Biology: [Biological Molecules—You Are What You Eat](http://viewpure.com/H8WJ2KENlK0&feature=edu&list=PL3EED4C1D684D3ADF)
* BioNinja (for IB students, but a good resource): [Chemical Elements and Water](http://www.ib.bioninja.com.au/standard-level/topic-3-chemicals-of-life/31-chemical-elements-and.html)
* BioNinja (for IB students, but a good resource): [Carbohydrates, Lipids and Proteins](http://www.ib.bioninja.com.au/standard-level/topic-3-chemicals-of-life/32-carbohydrates-lipids-and.html)
* Kimball’s Biology Pages: [Hydrogen Bonding](http://users.rcn.com/jkimball.ma.ultranet/BiologyPages/H/HydrogenBonds.html)

**Listen and Look**: Here is a list of key terms and concepts you will hear about and see during these podcasts and chapter readings. Get to know them! Be able to connect them to one another using a concept map. **Don’t just simply define the terms—you must understand the relationships among and between them!**

**KEY TERMS**

|  |  |  |  |
| --- | --- | --- | --- |
| Polarity | Polar | Monomer | Polymer |
| Hydrophobic | Hydrophilic | Van der Waals interactions | Ionic bonding |
| Cohesion | Organic | Inorganic | Hydrophobic interaction |
| Covalent bond | Hydrogen bond | Hydrolysis | Dehydration synthesis (condensation) |
| Macromolecule | Carbohydrate | Monosaccharide | Disaccharide |
| Polysaccharide | Lipid | Nonpolar | Amphipathic |
| Phospholipid | Triglyceride fat | Saturated fat | Unsaturated fat |

**Recall and Review:** Use the lecture in the videos and your textbook reading to help you answer these questions on a separate sheet of paper.

1. **Create** a t-chart that illustrates the difference between cohesion and adhesion of water molecules. **Explain** why each of these properties are significant to living things.
2. **Create** four drawings that illustrate the properties of water that deal directly with hydrogen bonding.
3. Using a graphic organizer, **explain** how water’s high specific heat, high heat of vaporization and expansion upon freezing affect both aquatic and terrestrial ecosystems.
4. **Describe** how carbon skeletons may vary, and explain how this variation contributes to the diversity and complexity of organic molecules.
5. **Explain** how the letters of the alphabet are similar to monomers of a polymer.
6. **Explain** why the shape of a molecule is critical to determining its function.
7. **Draw** an example of two monomers forming a polymer through dehydration synthesis (condensation).
8. **Explain** the phrase “you are what you eat” in the context of dehydration synthesis and hydrolysis.
9. **Create** a graphic organizer that illustrates the structural and functional differences between the three types of carbohydrates.
10. **Identify:**
    1. the biological process that produces carbohydrates such as glucose, fructose and cellulose
    2. where this process occurs and in what types of organisms
11. **Describe** the hydrocarbon tail of a fatty acid. **Explain** why hydrocarbons are excellent sources of energy.
12. **Draw** a sketch of a saturated fatty acid and an unsaturated fatty acid, side by side. **Explain** how their respective structures influence their behavior in living cells.
13. **Explain** why the amphipathic quality of a phospholipid is ideal for the construction of cell membranes.
14. A friend of yours decides that they are going to cut *all* fat from their diet. **Explain** why such behavior could be detrimental to your friend’s health.

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| Learn More: For more examples of biologically important molecules, use the links below:   * Kimball’s Biology Pages: [Carbohydrates](http://users.rcn.com/jkimball.ma.ultranet/BiologyPages/C/Carbohydrates.html) * Kimball’s Biology Pages: [Fats](http://users.rcn.com/jkimball.ma.ultranet/BiologyPages/F/Fats.html) * NobelPrize.org Chirality Game: [learn about “handedness” of molecules](http://www.nobelprize.org/educational/chemistry/chiral/) * University of California: [Atoms, Molecules, Water, pH](http://biology.clc.uc.edu/courses/bio104/atom-h2o.htm) |

**Topic Review Guide**: Biologically Important Molecules, Part 2 (Videos 29-30)

**To Think About**: How do molecules and atoms from the environment build new molecules? In what ways do DNA and RNA molecules have similarities and differences that define their function? In what ways do the subcomponents of biological molecules and their sequences determine the properties of those molecules? What interactions between molecules affect their structure and function?

**Watch:**

**First:** : [Mr. Andersen’s “Proteins” video](http://viewpure.com/2Jgb_DpaQhM)

**Next:**  [Mr. Andersen’s “Nucleic Acids” video](http://quietube6.com/v.php/http://www.youtube.com/watch?v=NNASRkIU5Fw&list=PL7A750281106CD067)

**Read:** Chapter 3, pages 34-45: Hillis, Principles of Life, 1st ed. (2012).

**Supplementary Resources**: Click the links below for more information to help you learn more about this lesson.

* John Kyrk: [Amino Acids](http://www.johnkyrk.com/aminoacid.html)
* Crash Course Biology: [That’s Why Carbon is a Tramp](http://viewpure.com/QnQe0xW_JY4&feature=edu&list=PL3EED4C1D684D3ADF)
* Crash Course Biology: [Biological Molecules—You Are What You Eat](http://viewpure.com/H8WJ2KENlK0&feature=edu&list=PL3EED4C1D684D3ADF)
* Learn.Genetics: [DNA to Protein](http://learn.genetics.utah.edu/content/begin/dna/)
* DNA From the Beginning: [DNA and Proteins are key molecules of the cell nucleus](http://www.dnaftb.org/15/)

**Listen and Look**: Here is a list of key terms and concepts you will hear about and see during these podcasts and chapter readings. Get to know them! Be able to connect them to one another using a concept map. **Don’t just simply define the terms—you must understand the relationships among and between them!**

**KEY TERMS**

|  |  |  |  |
| --- | --- | --- | --- |
| Protein | Polypeptide | Hydrophobic | Hydrophilic |
| Amino acid | Peptide bond | Polar amino acid | Nonpolar amino acid |
| Primary structure | Secondary structure | Tertiary structure | Dehydration synthesis (condensation) |
| Quaternary structure | Denaturing | Nucleic acid | Nucleotide |
| DNA | RNA | Hydrogen bonds | Complementary base pairing |
| Transcription | Translation | Replication |  |

**Recall and Review:** Use the lecture in the videos and your textbook reading to help you answer these questions on a separate sheet of paper.

1. **Explain** why the shape of a molecule is critical to determining its function.
2. **Draw** the generalized structure of an amino acid. **Label** where dehydration synthesis will occur when amino acids join together to build proteins. **Explain** howchangingthe R group changes the properties of the amino acid.
3. **Draw** an example of two amino acids forming a dipeptide through dehydration synthesis (condensation).
4. **Identify:**
   1. the biological process that produces proteins
   2. where this process occurs and in what types of organisms
5. **Create** a 4-panel cartoon that illustrates the differences between the four levels of protein structure.
6. **Explain** how the environment surrounding a protein influence its shape and structure.
7. **Explain** the importance of hydrogen bonding in maintaining the structure of the nucleic acids DNA and RNA.
8. **Explain** the roles of DNA and RNA in making proteins.
9. **Describe** the similarities between ATP and nucleotides in DNA/RNA.
10. **Explain** how scientists think that DNA evolved from RNA and **describe** the bonds that hold the DNA molecule together.
11. **Explain** how DNA molecules can be so diverse even though they are structurally similar.

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| Learn More: For more examples of biologically important molecules, use the links below:   * [Foldit](http://fold.it/portal/): play a game to practice folding proteins * [Eterna](http://eterna.cmu.edu/web/): play a game to design RNA molecules * NobelPrize.org Chirality Game: [learn about “handedness” of molecules](http://www.nobelprize.org/educational/chemistry/chiral/) |

Finally Watch this:

Watch PBS Genius 5th episode called “What are we?” the link is below:

Students can access MediaConnect using a generic student account, which is as follows:

* Visit <http://mediaconnect.cnyric.org/>
* Enter [student@bville.org](mailto:student@bville.org)
* Password = **student**
* **Search Stephen Hawking Genius Episode 5 What are we?**

1. How do all of our millions of tiny machines work together to make life?
2. What are the few kinds of molecules that make you?
3. Where do the molecules come from?
4. What did Miller and Urey design to help figure out the early Earth? Draw and Explain.
5. What gases did they begin with?
6. What was produced?
7. What is primitive life?
8. What did they add to the bath? What was the living organism?
9. What is bacterial replication called?
10. What is DNA? Who discovered it? (Controversial!)
11. The ability to copy DNA allows what?
12. Why did the bacterial glow?
13. How many bacterial were produced? These are the basic unit of life called a?
14. Life is varied even though much of the machinery is the same. How?
15. What were the participants asked to do with the molding material?
16. Why were they thrown through the air?
17. Then the participants copied the winning shapes, were they identical to the first? What did that show about replication?
18. After each generation the shapes got closer to the target. What shape?
19. What is the “Origin of the Species”?
20. What are the struggles in life?
21. Who survives?
22. After generations (a great deal of time) they can morph into new organisms, what is this called?
23. Who was James Hutton? What did he tell us about geological time?
24. Name 5 events the participants ran through?
25. So what are we? List the steps that brought us here.