**Unit 4: DNA, Protein Synthesis and DNA Technology**

**Unit 4 References: Textbook Ch. 11 & 13**

**Quiz Dates: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Test Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**A: Nucleic Acid Structure**

1. Using the references listed above, define the following terms in **your own words** a. DNA
 b. RNA
 c. Nitrogenous Base
 d. Double helix
 e. Hydrogen bond
 f. Phosphate
 g. Pentose sugar
 h. Nucleotide

2. Complete a Venn Diagram to compare and contrast DNA and RNA:



RNA

DNA

3. List the 4 Nitrogenous bases in DNA and state the complimentary base pairing rule:
 a. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ which is abbreviated \_\_
 b. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ which is abbreviated \_\_
 c. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ which is abbreviated \_\_
 d \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ which is abbreviated \_\_

The complimentary base pairing rule states that \_\_\_ always bonds with \_\_\_ and \_\_\_ always bonds with \_\_\_ in DNA. It's the same with RNA except that the base \_\_\_\_\_\_\_\_\_\_ replaces \_\_\_\_\_\_\_\_\_\_\_ so that \_\_\_ bonds with \_\_\_.

4. Which are stronger, hydrogen bonds or covalent bonds? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

5. Draw a DNA nucleotide and identify where covalent bonds are and where a hydrogen bond would form.

**B: Replication**

1. **In your own words using less than 5 words,** define **Replication.**

Replication is a process that's not part of DNA's everyday function. Instead, it's only used in preparation for 1 important cell process that we've learned about. What is that process? ­­­­­­­­­­­\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2. Play the simulations and animations on Replication at:

<https://www.youtube.com/watch?v=dKubyIRiN84>

<http://highered.mheducation.com/sites/0072943696/student_view0/chapter3/animation__dna_replication__quiz_1_.html>

 **Sketch** and describe a replication fork. Why is "fork" an appropriate name?

3. What biochemicals support the process of replication by doing things like untwisting/re-twisting DNA, positioning new nucleotides, proofreading the new strand, etc?

4. Replication is said to be a **semi-conservative** process. What does that mean? (Hint: think about what it means to conserve something. What's being conserved during replication?)

5. Once DNA is replicated, does it stay in the nucleus or leave? Why?

**C. Protein Synthesis**

1. **In your own words using less than 7 words,** define **transcription.**

2. Complete a Venn diagram below to compare and contrast replication and transcription:



Transcription

Replication

3. **In your own words using less than 7 words**, define **Translation**

4. Protein Synthesis is a two-step process. To see the steps, work through the simulation at: http://learn.genetics.utah.edu/content/molecules/transcribe/

Once you've seen the steps, fill in the chart below for these steps:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Step of Protein Synthesis** | **Nucleic Acid(s) Involvved** | **Location of the Step (in the cell)** | **Product (s) of the Step** | **The Point of Taking the Step** |
| 1. Transcription |  |  |  |  |
| 2. Translation |  |  |  |  |

5. Define the following terms in your own words:
 a. Codon
 b. Anticodon
 c. mRNA
 d. tRNA
 e. rRNA
 f. Mutation

**D. DNA Technology**

1. Define the following terms in your own words:
 a. restriction enzyme
 b. plasmid
 c. genetic engineering
 d. transgenic organism
 e. genome

2. We'll go over how Gel electrophoresis works in class. However, watch the prezi at [http://prezi.com/lsjwxwdd5fnp/?utm\_campaign=share&utm\_medium=copy&rc=ex0share and describe](http://prezi.com/lsjwxwdd5fnp/?utm_campaign=share&utm_medium=copy&rc=ex0share%20and%20describe%20) 3 uses of gel electrophoresis in biotechnology:

 a.

 b.

 c.

3. Watch the first 10:35 minutes of the video at [http://www.knowmia.com/watch/lesson/37542](http://www.knowmia.com/watch/lesson/37542%20) and answer the following:

 a. what is recombinant DNA?

 b. List and describe the uses of recombinant DNA technology:

4. Watch the video at: https[://animoto.com/play/0aitkUH3lLuvxpA1gGKqoA](https://animoto.com/play/0aitkUH3lLuvxpA1gGKqoA)

 a. What is the connection between cloning and stem cells?

 b. Fill out the chart below

|  |  |  |
| --- | --- | --- |
| Type of Cloning | Natural or Done in a Lab? | Purpose? |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

5. Watch the video at <https://animoto.com/play/mwIgOx9VdgJnyXyP0WQXcA> and describe the connection between the HGP and gene therapy.