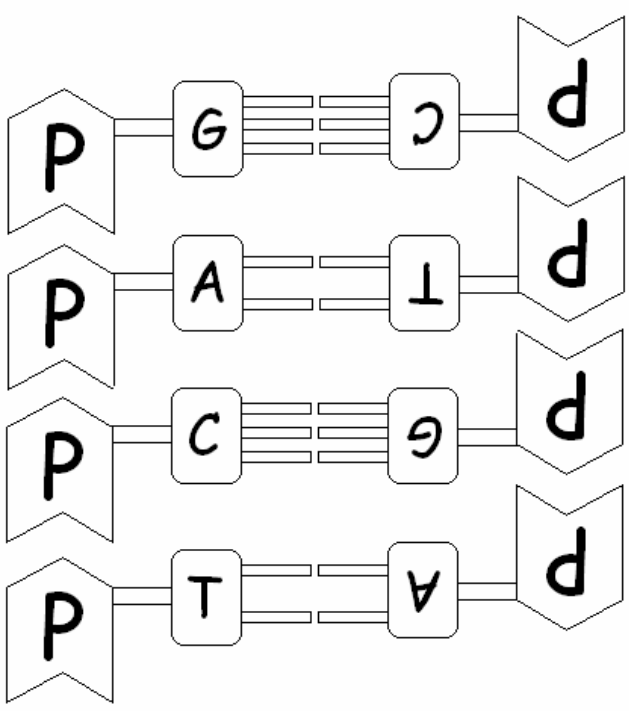
Biology Class **Ms. Bokas/Mr.Winkler**

Lesson: Modeling DNA Replication and Mutation
Opening Questions
1. What do you think DNA is? What is its function?

2. What do you think mutations are? How do you think they occur?

Procedure
Part 1: Assembling your DNA molecule

Create your DNA molecule using the pieces you are given. Assemble the molecule as shown in the diagram below:



Questions

1. Write down 5 observations about this DNA molecule (i.e. What do you notice about how the bases pair together? How many strands of bases are there?, Do the strands have a direction? etc)

a.)

b.)

c.)

d.)

e.)

2.) If you were going to make a copy of your DNA molecule so that you would have two molecules that are exactly the same, how might you accomplish this? Would you create the molecule from scratch, or would you use the current molecule in some way to create the new one?

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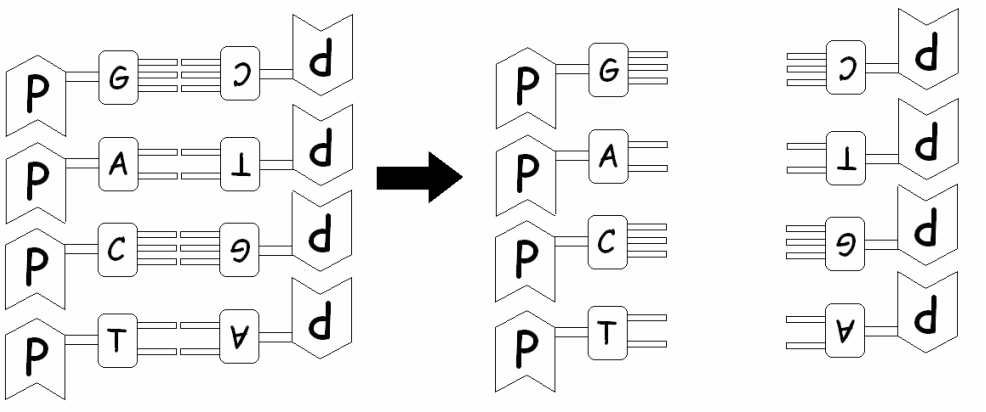
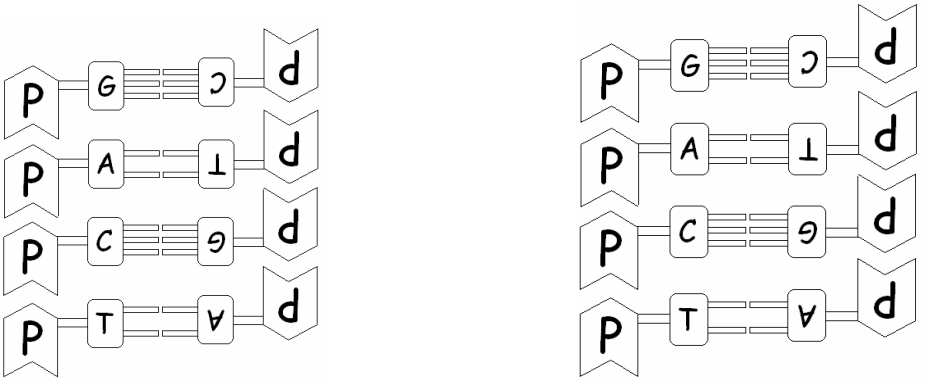
Part 2: Replicating the DNA Molecule

DNA replication is absolutely essential for life to continue. Now we are going to use our model to see how DNA replication produces a DNA strand that is exactly like the one we already have.

Procedure
1. Pull the DNA apart in the following manner:



2. Now add the bases to each separated strand, using the base pairing rules you discovered in Part 1 (i.e. G pairs with C, A pairs with T).



Congratulations! You've now replicated your DNA! Answer the following questions:

1.) When you made the new DNA molecule, did you make it completely from scratch, or did you use part of the old molecule to do it?

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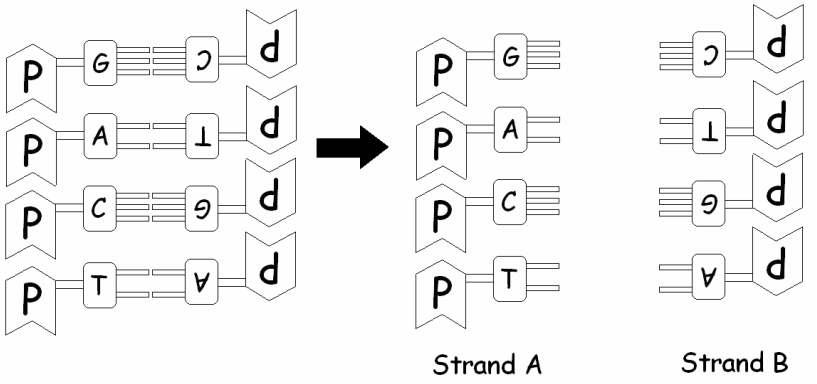
2.) How did the base pairing rules you identified in Part 1 help you to replicate the DNA?

Part 3: Creating a mutation in the DNA molecule.

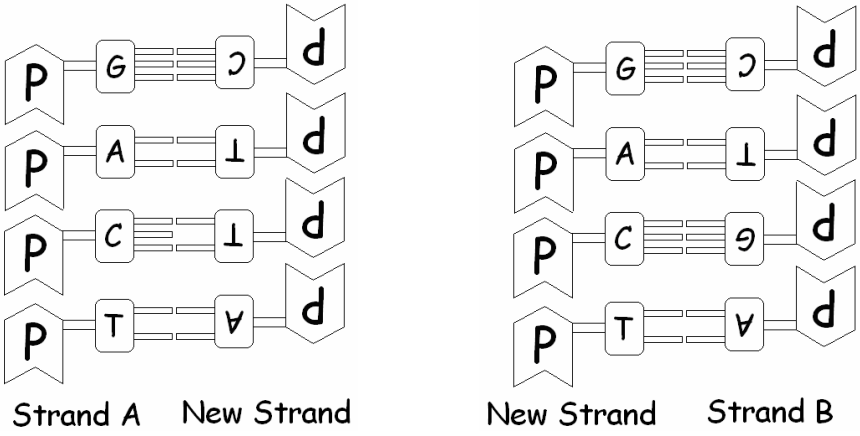
A mutation is any change that occurs in the sequence of DNA bases. Sometimes when the cell is replicating its DNA, it makes a mistake and puts the wrong base in. We will model this process here.

Procedure

1. Take one of the double stranded DNA molecules you made in Part 2 and repeat the strand separation process.



2. Now you are going to replicate the DNA again, but this time, when you are adding the bases to Strand A, instead of adding a G to the C, add a T in its place. This will serve as the mutation. ONLY DO THIS FOR STRAND A. Strand B should be replicated correctly. Your DNA molecules should now look like this:



Questions

1. What do you notice about the way the Cytosine (C) in Strand A pairs with the Thymine (T) in the new strand? Do they look like they should be paired together normally?

2. If we were to replicate the mutated DNA strand again, what do you think would happen? Draw out the replication process for the DNA molecule that was mutated and show what the two final DNA molecules would look like.

Assessment

1. DNA is a double stranded molecule. Given the following single DNA strand of bases, use what you know about how the bases pair together to write down the opposite DNA strand.

Strand 1: A A A A T T G G G G C C C T A G C T A

Strand 2: _____

2. Erwin Chargaff was an Austrian scientist who was the first to discover that in natural DNA molecules, the number of Cytosine (C) bases always equaled the number of Guanine (G) and the number of Adenine (A) bases always equaled the number of Thymine (T) bases. Using what you now know about DNA, explain why this is true. In other words, why do the number of A bases equal the number of T bases, and why do the number of G bases equal the number of C bases?

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3. When DNA is replicated, does it create the new DNA molecule completely from scratch, or does it use the original DNA molecule in some way? If it uses the original DNA molecule, how does it do this?

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