**Modeling Semi-conservative DNA Replication**

**Goal:** To familiarize yourself with processes of DNA replication and to be able to demonstrate your understanding by animating and drawing the process using the model as a learning tool.

**Essential Question:** How is DNA replication on the leading and lagging strands the same and different?

**5’**

**Build the Model:**

**A**

**A**

**T**

**C**

**T**

**C**

**G**

**A**

**T**

**T**

**A**

**G**

**T**

**A
A**

1. Using the single nucleotide pieces, build a model of DNA according to the sequence of the single strand **shown to the right**. This is the **BOTTOM** strand of your model.
2. **Match** this strand with complementary DNA nucleotides. **Label the 5’ and 3’ ends.**

***Concept check*:** Does your DNA molecule segment have anti-parallel strands? (Hint: what part of the nucleotide should be running in the opposite direction?)

3. Decide which enzyme will split the parent DNA molecule at the **3rd base pair** (just after A-A-T). Cut it out.

**Enzyme name**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

4. Use cutouts to **label** the position of the **replication fork** and the **leading** and **lagging strands**.

**What molecules will anneal (bind to) the split nucleotides to prevent the strands from re-annealing? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

5. **Add** these molecules to your model

6. On the **leading strand:** Decide which **enzyme** should lay an RNA primer of **3 base pairs** long, and pair the appropriate bases.

**Enzyme name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Write the base pairs:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

***Concept check*:** Where should the RNA primer begin on the leading strand?

**3’**

7. Decide which **enzyme** should lay the c**omplimentary DNA bases** to the rest of the leading strand and pair the appropriate bases.

**Enzyme name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Write the base pairs**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Label the 5’ and 3’ ends of the new daughter strand**.

***Concept check*:** Which direction should this enzyme lay the complimentary bases? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

8. On the **lagging strand:** Repeat step 6 for the lagging strand using **2 separate sections** of RNA primer (3 base pairs long each).

9. Repeat step 7 for the lagging strand. **Enzyme name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Write the base pairs**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **What are fragments called?** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

10. **Label** the **5’** and **3’** ends of the new **daughter** strand.

11. **Label** the **Okazaki fragments**.

12. Decide which **enzyme** should **replace** the RNA primers with the appropriate complementary DNA base pairs, and pair the appropriate bases.

**Enzyme name:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **Base Pairs:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

***Concept check*:** Which direction should this enzyme lay the complimentary bases? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

13. Decide which **enzyme** should create **phosphodiester** bonds to **repair** the nicks left between the Okazaki fragments (not shown in the model).

**Enzyme name:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

14. **Label** each strand according to whether they underwent **continuous** or **discontinuous** synthesis.

15. With your partner, repeat this entire process **without** your notes or these instructions.

**CONGRATULATIONS! You have just modeled DNA Replication ☺**

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