**DNA Replication Worksheet**  Name:

*Directions: The students will use the two animations from the below link to answer the question set for each of the first two animations.*

[http://highered.mcgraw-hill.com/sites/0072437316/student\_view0/chapter14/animations.html#](http://highered.mcgraw-hill.com/sites/0072437316/student_view0/chapter14/animations.html)

**Animation One: How Nucleotides are added in DNA replication? (Animation)**

1. List the proteins/enzymes involved in the process of replication. (<http://sites.fas.harvard.edu/~biotext/animations/replication1.swf> is also a great link, click the “Fork with Proteins” link)

2. How does replication start? Who prevents the unwound DNA for twisting back?

3. Which enzyme is the key player in Replication? What is this enzyme’s limitation? How is this limitation overcome?

4. Why the two strands of the helix have to be elongated by two slightly different mechanisms?

5. Explain elongation stage of replication – you answer should include a discussion of leading strand, lagging strand, Okazaki pieces and RNA primer.

**Animation Two: DNA replication fork (Animation)**

6. Draw a picture of the replication fork and label all the components.

7. How are Okazaki fragments on the lagging strand joined into one continuous strand?

8. How do eukaryotes speed the process of replication – since they have multiple long chromosomes?

**Part Three: Questions 9 – 25 DO NOT necessarily come from the links you used above but many will.**

9. Create a matching (complementary) DNA sequence for the following strand: DNA Replication

10. Replication means:

11. DNA must “unzip” to replicate. In detail, describe how DNA “unzips”.

12. What is a mutation? What would a mutation look like in a DNA molecule?

13. What is the importance of DNA polymerase I?

14. What enzyme unzips the parent strand of DNA?

15. What enzyme synthesizes the new DNA strand?

16. What are the discontinuously copied strands of the new DNA called?

17. DNA replication happens only in the \_\_\_\_\_ to \_\_\_\_\_\_ direction.

18. What is the complete name of DNA?

19. DNA strands are complementary. How does this allow DNA to duplicate itself (replicate)?

20. Why is DNA replication called semi-conservative?

21. What is the role of DNA polymerase (III)?

22. What is a primer?

23. In what direction does DNA replication occur?

24. What is the difference between leading strands and lagging strands?

25. What are Okazaki fragments?

26. What enzyme is responsible for unwinding the DNA double helix, allowing the polymerase to bind?

27. Which enzyme removes primers between Okazaki fragments?

28. Which enzyme joins the Okazaki fragments together on the lagging strand?

You will draw out the steps of the S-phase of Interphase, DNA replication. In each box, draw the event described. You will use 3 different colors: **one for the original strands of DNA**, **one for the leading strand**, and **one for the lagging strand**. You must label all the bold words below in each drawing. Use the following link to help you, using the “Replication Fork” and “Fork with Proteins” links at the top of the page to help you: <http://sites.fas.harvard.edu/~biotext/animations/replication1.swf>

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| 1. Draw the DNA double helix, with this sequence on the 5’ to 3’ strand: ACCGTATTGATC Label the 5’ and 3’ on each strand. | 2. Draw helicase as it begins to unwind the DNA at the replication fork. Be sure to include the **single-stranding binding proteins (SSBPs).** | 3. **DNA polymerase III** adds complementary bases **continuously** in the 5’ to 3’ direction (**leading strand**). | 4. **Primase** adds a short RNA segment to the **lagging stand**. **DNA polymerase III** adds complementary bases **discontinuously** in the 5’ to 3’ direction, forming **Okazaki fragments.** RNA primer replaced with DNA by **DNA polymerase I**; and finally, DNA fragments are connected by **DNA ligase**. | 5. Two DNA double helices are formed, showing **semi-conservative replication.** |

Key terms to know for this set of lessons on DNA replication:

Helicase Okazaki fragment semi-conservative replication

Topioisomerase DNA ligase replication fork

Single-stranded binding proteins leading strand parent DNA

DNA polymerase I (DNA pol I) lagging strand enzyme

DNA polymerase III (DNA pol III) continuous replication

DNA primase discontinuous replication