

# Cell Division: DNA Replication

Cell Molecular Stories Booklet: Chapter #2

**GOAL:** students will create a booklet (chapter #2) which explains how a small 24-letter gene code in the DNA (GATTACAGATTACAGATTACAGAT) is replicated. After downloading the scrambled pictures and text, students will first organize the 11 text in the correct sequence and then match and sequence the corresponding 20 replication pictures. This booklet could be created in a variety of ways: word processing (e.g., MS Word) or slide show software (e.g., MS Powerpoint), or design an interactive web page.

## PROJECT DIRECTIONS:

1) Download the scrambled pictures and text from the Weebly webpage: [geneticsraypec.weebly.com](http://geneticsraypec.weebly.com)

- I recommend using **Copy-N-Paste** to more easily work with the pictures and text on your own computer

2) Arrange the **11 “text”** scenes of DNA Replication (included below) in the CORRECT SEQUENCE

### 11 “TEXT” SCENES OF DNA REPLICATION

- **Ligase** links all the DNA fragments into 2 continuous chains
- DNA **Helicase** enzymes bind to the DNA gene in the middle at an origin site and begin to unwind and unzip the DNA strands creating replication “bubble” for replication.
- Final Overview of semi-conservative replication: 2 identical genes (each ½ old and ½ new DNA)
- **LEADING** strand polymerase I enzymes disappear out of view as the **LAGGING** Polymerase I “leapfrogs” to the 2<sup>nd</sup> primer and then builds the 2<sup>nd</sup> Okazaki fragments (add 4 NT) until bumping into the 1<sup>st</sup> Okazaki fragment primers.
- 2 DNA **Polymerase I** enzymes each begin to build a leading strand in a different directions by adding 4 new complementary DNA nucleotides in 5'→3' direction beginning at the RNA primer's free 3' end.
- While Polymerase I adds 4 more NT to finish the **LEADING** strand, 2 new Polymerase I enzymes add 4 NT (5'→3') to the **LAGGING** strand (forming the 1<sup>st</sup> Okazaki fragment) and then “bump” into previously built **LEADING** strand primers. Primase is also busy building the 2<sup>nd</sup> **LAGGING** strand primer (2 NT) starting from the end of the parent DNA strand.
- DNA gene overview: 2 complementary strands of 24 letters each spiraled in a helix shape
- RNA **Primase** enzymes insert 2 RNA Primers (2 nucleotides or NT) which “jump start” the top & bottom **LEADING** strands
- **Polymerase II** enzymes replace the RNA primers with DNA nucleotides (but cannot link new DNA to “neighbor” DNA)
- As Polymerase I adds 2 more NT to the leading strands, Primase begins (directly across) building 1<sup>st</sup> RNA Primers (2 NT) to begin **LAGGING** strands.
- **Repair Enzyme** proofreads down the nitrogen bases and repairs mistakes or mutations in the code

3) **Match** each of the **20 pictures** of DNA Replication with the appropriate text scene

- Some text will have more than one picture that will match with it
- For scenes with multiple pictures, all pictures should be organized in the correct sequence and then connected in the proper sequence with arrows

4) **LABEL** (and draw and arrow→ to ID) the following **12** items at least once in your booklet .....

Also use circles and brackets as needed to help clearly ID each of the **12** concepts below:

- Leading strand, lagging strand, nucleotide, free 3', Okazaki fragment, DNA mutation, RNA primer, RNA primase, Ligase, Helicase, DNA Polymerase I, DNA Polymerase II

5) ) Turn in your booklet (with the SELF-GRADED SCORING GUIDE) by the **due date** =

- Bring a PRINTED copy of your booklet chapter 2 to class

**OR**

- UPLOAD your file to the **Weebly** link: [geneticsraypec.weebly.com](http://geneticsraypec.weebly.com)
- Plan B = send Mr. Roberts an email ([mike.roberts@raypec.org](mailto:mike.roberts@raypec.org)) and SHARE your MM Booklet file that is stored on your Google Drive

# DNA Replication Chapter 2 Name \_\_\_\_\_

## Scoring Guide (25 pts)

CRITERIA:

5 pts

3 pts

1 point

0 pts

1. <b>Replication</b> Text Correct?: <ul style="list-style-type: none"> <li>• Include 11 replication text?</li> <li>• text matched to correct picture?</li> <li>• Correct sequence?</li> </ul>	ALL	MOST	SOME	NONE
2. Includes 20 <u>Required Pictures</u> ?	ALL	MOST	SOME	NONE
4. <u>Picture ACCURACY</u> <ul style="list-style-type: none"> <li>• Correct Picture SEQUENCE?</li> <li>• 20 pictures matched to correct text</li> <li>• For scenes with multiple pictures, all pictures connected in correct sequence with arrows</li> </ul>	ALL	MOST	SOME	NONE
5. <b>12 LABELED</b> picture items <ul style="list-style-type: none"> <li>• Identified correctly &amp; CLEAR?</li> <li>• use arrows, brackets, circles</li> </ul>	ALL	MOST	SOME	NONE
6. Followed Project Directions?	YES	-----	-----	NO

Subtotals

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**FINAL SCORE**